

All Rights Reserved.

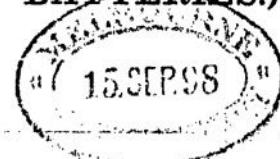
40185-  
7835

## HANDBOOK

FOR THE

**15-PR. B.L. GUN (MARK I).**

(FIELD BATTERIES.)



1896.



LONDON.

LONDON:  
PRINTED FOR HER MAJESTY'S STATIONERY OFFICE,  
BY HARRISON AND SONS, ST. MARTIN'S LANE.

PRINTERS IN ORDINARY TO HER MAJESTY.

er direct  
AST-H  
12  
H

[All Rights Reserved.

40185  
7835

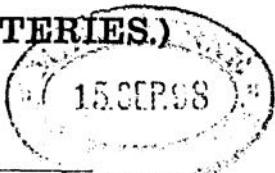
1817

# HANDBOOK

FOR THE

**15-PR. B.L. GUN (MARK I).**

(FIELD BATTERIES.)



1896.



LONDON:

PRINTED FOR HER MAJESTY'S STATIONERY OFFICE,  
BY HARRISON AND SONS, ST. MARTIN'S LANE,  
PRINTERS IN ORDINARY TO HER MAJESTY.

And to be purchased, either directly or through any Bookseller, from  
**TYRK & SPOTTISWOODE**, EAST HARDING STREET, FLEET STREET, E.C.; or  
**JOHN MENZIES & Co.**, 12, HANOVER STREET, EDINBURGH; and  
90, WEST NILK STREET, GLASGOW; or  
**HODGES, FIGGIS, & Co., Limited**, 104, GRAFTON STREET, DUBLIN.

Price One Shilling and Sixpence.

(Wt. 1205 250 4 | 97—H & S 6023.)

## CONTENTS.

## DIAGRAMS OF PACKING.

Carriages, Ammunition Wagons, and Limbers ..	..	..	..	..	60
Forge Wagons ..	..	..	..	..	*
Store Wagons ..	..	..	..	..	*

## PLATES.

## LITHOGRAPHS.

Near side and rear of Limber and Carriage, with Limber Box open..	..	XII.
Off " front	closed	XIII.
Near " rear of Limber and Wagon, with Boxes open..	..	XIV.
Off " front " " " " closed	..	XV.
Team, near and off .. .. .. .. .. .. ..	..	XVI.

N.B.—*This book is corrected up to August, 1896. Any alterations which may be suggested should be forwarded direct to Chief Inspector, Royal Arsenal, Woolwich.*

\* Will be issued hereafter.

# 15-PR. B.L. GUN (MARK I).

## DESCRIPTION OF GUN.

### GUN.

(Plate I.)

Material ..	..	..	..	Steel.
Length, total ..	..	..	..	92·35 inches.
Weight, average ..	..	..	..	7 cwt.
Preponderance* ..	..	..	..	10 lb.
Bore ..	diameter length .. { in inches .. capacity, including chamber and grooves ..	..	..	3 inches. 84 " 28 calibres.
Chamber ..		..	..	647 cubic inches. 3·625 inches.
		..	..	11 inches. 118 cubic inches.
Rifling ..	diameter .. length .. grooves { number .. depth .. width ..	..	..	Polygroove—hook section. Increasing from 1 turn in 120 calibres at breech to 1 turn in 28 calibres at 35·8 inches from breech, remainder uniform 1 in 28 calibres. 71·6 inches. 12 0·04 inch } Mark I, rifling. 0·6 "
Means of rotation ..	..	..	..	Copper driving band.
Vent ..	..	..	..	Radial, "T," removable, 1 inch in front of obturator.

All 15-pr. B.L. guns will, in future manufacture, be rifled on the principle of six grooves to each inch of calibre, the depth of the grooves remaining the same as at present.

### The Gun.

The gun is made entirely of steel, and consists of an A tube, over which is shrunk a jacket with trunnions, secured longitudinally by interlocking, and prolonged at the breech for the reception of the screw. In front of the jacket is shrunk the C hoop, secured to the A tube by a set screw. To the breech-end is screwed a hood which gives protection to the breech fittings and carries the elevating bolt and sockets for the tangent sights.

The chamber is cylindrical, slightly coned at the entrance, and terminating in front with a curved slope.

\* Six guns, viz., No. 10 to No. 15, have a preponderance of 42 lb.

### Breech-closing Arrangements.

(Plate II.)

The breech is closed by a screw provided with a cam lever, and has three portions of the screw thread removed longitudinally, each one-sixth of the circumference. The interior of the gun at the breech being prepared in a similar manner, admits of the screw, when the raised portions are placed opposite the smooth surfaces in the gun, being pushed home, and locked by the sixth of a turn.

The screw has hinged to it a cam lever, by which it is locked and unlocked, the cam portion of this lever (when the breech screw is locked) falls into a recess in the carrier ring, and so prevents any movements of the breech screw during firing. In depressing the cam lever, after the breech screw is unlocked, the cam acting upon the surface of the carrier ring, starts the first movement to the rear of the breech screw and obturator.

Passing through the breech screw is a solid spindle, having at its inner end a mushroom head, behind which are placed the obturating pad and discs, and at the outer end a removable spring clip that secures it in the breech screw.

Encircling the rear end of the breech screw, and hinged to the "hood," is a carrier ring, which supports the screw when withdrawn.

The carrier ring is held to the gun during the withdrawal of the breech screw by a "clip," pivoted within the left side of the ring, engaging with a recess in the hood.

A stop bolt in the right side of the carrier ring prevents the breech screw being disengaged from the carrier when withdrawn; at the same time the clip is disengaged from the recess in the hood by means of a spring, which forces its opposite end into a recess in the breech screw, thus securing the latter in the carrier ring. When in this position the whole can be swung clear of the breech opening to admit of loading.

On the left side of the breech is a small hole, in which a "drift vent" can be inserted, to push back the retaining clip of the carrier ring, if necessary.

### Venting.

The gun is furnished with a radial "T" vent. The vent is made in two parts, and consists of a vent bolt furnished with a vent head provided with a double bayonet joint for the reception of the cross-head of the T friction tube. The vent head is so arranged that when the tube is placed in the vent and the crosshead of the tube turned, so as to engage with the bayonet joint, the tube is forced tightly into the vent. This action, together with the sealing of the tube by the ball placed therein, prevents the rush of gas and consequent scoring of the vent channel when the gun is fired. The vent is fitted in the gun from the exterior, and is provided with a spring washer and key; the latter engages with a corresponding recess in the gun and thus prevents the vent from turning whilst being secured (by a screwed head and copper washer) from the interior of the powder chamber of the gun.

A ratchet wrench (in two parts) is provided for removing or replacing the vent in the gun.

A T-vent rimer is provided for clearing the taper portion of the vent channel in the T vent, in the event of it getting choked, so as to admit of the insertion of the tube.

## Sights.

### (Plate III.)

The gun is provided with two rows of sights.

The tangent sights are of steel; the crossheads are furnished with screw deflection leaves, giving deflection to  $1\frac{1}{2}$  degrees right and left, and having notches at the top, and small eye holes underneath. The bars are triangular in section, and are graduated on the left face in the case of converted sights with a yard scale graduated to 5,100 yards, reading to 25 yards (for use with the charge and projectiles of the 15-pr. B.L. gun), for a muzzle velocity of 1,574 ft. secs. with Marks I\* and IA\* sights, and 1,569 ft. secs. with Marks II\* and II<sub>A</sub>\*; the right face is graduated with a degree scale to 13 degrees; and the rear face with a yard scale for use with the charge and projectiles of the 12-pr. B.L. 7-cwt. gun. New sights, Mark III, for guns on Mark I carriages, and Mark IV, for guns on Mark II carriages, differ from the converted sights described above in not being graduated for the 12-pr. charge and projectile; the yard scale is engraved on the rear face for a muzzle velocity of 1,574 ft. secs. with Mark III sights, and 1,569 ft. secs. with Mark IV sights. The sights fit into gunmetal sockets held by fixing screws, and are provided with movable clamps.

Spring bolts passing through the sockets enter recesses in the sight bars when at zero, and prevent their being shaken out when the gun is passing over rough ground. The bolt on the right side is moved by pushing in, and that on the left by pulling out, so as to make the sights interchangeable.

The fore sights are of bronze, with circular apertures containing diagonal cross-wires (in the case of Mark I sights) and a horizontal aluminium blade, projecting from the left side to the centre (in the case of Mark II sights) and surmounted by steel acorn points. The sights are interchangeable, and slide into grooves in front of the trunnions, being retained by spring studs, which are released by raising the catches provided for the purpose.

The Marks I\*, IA\*, and III tangent sights, in conjunction with the Mark I\* or Mark II clamp, are used with guns mounted on Mark I carriages; and in conjunction with the Mark I\*\* clamp, with guns on Mark II carriages.

The Marks II\*, II<sub>A</sub>\*, and IV tangent sights, in conjunction with the Mark I or Mark II clamp, are used with guns on Mark II carriages only.

It must be remembered that although the Mark I\* tangent sight with Mark I\*\* clamp is correct for guns on Mark II carriages as far as the yard scale is concerned, it is not correct when using the degree scale.

The sight is correctly set:—

*For Elevation.*—When no space can be seen between the line marking the graduation ordered and the top of the clamp, while the line is not covered by the clamp.

*For Deflection.*—When the line marking the graduation ordered is exactly in continuation of the arrow head.

### (Scott's) Telescopic Sight.

The guns have been fitted with a steel bracket for carrying the telescopic sight. The bracket is firmly attached to the face of the right trunnion by a dovetail and two fixing screws. A bronze adjust-

ing screw is provided in the upper part of the bracket to alter the position of the telescope, so as to correct for difference of level of the wheels. Description and instructions for using, &c., are published in a separate handbook.

The edges of the bracket are rounded to avoid the liability of damage to the clothing of the number mounted on the axletree seat.

A leather cover for the bracket has also been provided; it is shaped to suit the bracket, and secured in position by a  $\frac{5}{8}$ -inch strap.

#### INSTRUCTIONS FOR THE CARE OF 15-PR. B.L. GUN.

The gun should be examined after firing 150 rounds with projectiles.

The breech fittings should be kept clean and oiled or greased, and in good working order; all working surfaces must be well lubricated, the fittings being taken off sometimes for this purpose, especially after firing.

To lubricate the hinge bolt of the carrier ring without removing the fittings, the small screw on the top of the bolt should be removed and oil poured into the channel, taking care to replace the screw after oiling.

All fittings of the gun should be treated with care; violence and jerks should be avoided, and no unnecessary force should be employed.

The breech fittings should work easily, and be free from cracks and burrs. The latter can be removed by filing, but this must be done carefully, so as not to permanently damage the fitting. Should a crack be observed in a breech fitting, it should be exchanged if possible.

The threads of the breech screw should be free from burrs; should the screw not work easily when the obturator has been detached, the defect may often be remedied by careful filing, but no portion of the thread should be cut away to remove a crack, &c.

The breech should be kept covered up if possible, to prevent dust and grit getting into the interstices of the breech fittings, which might impede their easy working. A leather cover is provided for this purpose.

#### De Bânge Obturator.

This obturator consists of a mushroom-headed spindle of steel, fixed to the breech screw by an axial stem, with a pad and pair of metal discs. The face of the breech screw is flat, and between its smooth surface and the back of the axial head, the pads and discs are arranged. The pad is made of asbestos, worked up with mutton suet to a proper consistency, and enclosed in a strong canvas cover; it is reduced to shape and pressed in a hydraulic machine and afterwards subjected to higher pressure in the gun by firing heavy charges at proof. The pad is enclosed between two tin plates, the outer angles of which are protected by rings of steel. The gun is slightly coned at the seat of the obturator when pushed home, and the pad is provided with a similar taper to ensure a good fit.

In putting the obturating pad and discs on to the head or vent axial, first place the front protecting disc with its rounded side fitting the back of the mushroom head, then the pad with that side to the front which is curved to fit the front disc, the stitched side being to the rear; then the rear protecting disc, and in placing this its flat

side and bronze ring with which it is bushed should be on the opposite side to the pad.

If correctly assembled, the whole should fit together compactly. Should there be any play between the obturator and the face of the breech screw, one or more adjusting discs are placed behind the protecting disc.

The pads and discs issued on the breech screw with a gun, have always been previously expounded in that gun, but the first time any other pad is used, it should be with a shotted round.

#### *Action.*

When the breech screw is pushed into the gun the obturator enters the chamber with perfect ease; on turning the breech screw, the pad is pressed home into the coned seat in the gun by the travel of the screw. The bore is thus perfectly closed by a species of buffer in contact all round the circumference, while the axial head forms a loose end to receive the force of the gas on discharge. On firing the gun the pressure acts on the steel mushroom head, which squeezes the pad against the breech screw, causing it to expand laterally; from symmetry of form and position this expansion must be radial to the axis and equal in every direction, and is sufficient to prevent the escape of the gas. On the pressure being removed, elasticity comes into play, and the obturator can be withdrawn from the cone by a straight pull, which can be given as soon as the screw is unlocked.

The pads are almost indestructible, except perhaps from the wear of opening and closing the breech, but if the firing is rapid they may get softened by heat; in this case the pad should be changed and thrown into cold water for a time, when it will soon be restored to good condition again. Spare pads are provided and also steel adjusting discs, which should be inserted between the rear protecting disc and the face of the breech screw if the pad becomes compressed by firing, but the obturator should always turn freely in the breech screw.

The outer canvas of the obturating pad should be free from rents; small bruises likely to be removed by the pressure of firing are of no importance.

If the pad is not in good order, or there are too many adjusting discs behind the pad, stiffness in working the breech will probably result.

The obturating pad should be rubbed occasionally with Russian tallow, mixed with oil or some other suitable lubricant, and the pad and protecting discs should be carefully handled to prevent them being indented or bruised.

The obturating pads and discs should be kept complete on the steel head in the gun, or in the brass boxes provided for the purpose, as there is a tendency of the pad to swell in the direction of its axis, which might cause difficulty in adjusting it on the mushroom.

When the obturator is attached to the breech screw, the removal of the latter from the carrier ring should be done by two persons, as care is necessary to keep the "clip carrier ring" pressed up clear of the breech screw before drawing the latter back, to avoid damaging the obturator. The obturator should, however, always be detached, when possible, from the breech screw before removing the latter from the carrier ring.

#### *Clip, Carrier Ring.*

If, when opening the breech, the carrier ring remains fast, owing to the "clip" not working properly, the latter can be pushed back

by inserting a vent drift in the hole provided for this purpose on the side of the breech, and tapping it with a hammer.

#### Vent.

Great care should be taken that the T vent is properly screwed up, otherwise the rush of gas may cut through the copper washer and erode the gun, so that the washer will no longer be effective in preventing the rush of gas, and the erosion will increase until the vent hole has been bushed.

On inserting a new one, care must be taken that it is well tightened up, and that the copper washer is properly placed. The vent nut is liable to be loosened by firing, and it is desirable that it should be tightened after the first round and subsequently if necessary.

### To Remove the Breech Fittings.

#### Obturator.

Take off the clip which secures the outer end of the axial head, the obturator can then be withdrawn from the front of the breech screw, and the pad and discs removed from the head.

#### Breech Screw.

When the breech is open, the breech screw is held in the carrier ring by a stop bolt on the right, and by the "clip carrier ring" on the left, by lifting up the clip, and moving the breech screw forward, the stop bolt can be pushed out from behind; then, by holding up the clip, the breech screw can be withdrawn from the carrier ring.

#### Carrier Ring.

This is attached to the breech by a hinge bolt secured by a keep pin; when the latter is taken out, the hinge bolt can be removed by giving it a few taps underneath with a piece of wood.

#### Clip, Carrier Ring.

This clip is held by an axis pin, on the removal of which the clip can be withdrawn.

In replacing the spring of the clip in the slot, care must be taken that the side having a small projection on it is uppermost, and that the projection is fitted into the small hole prepared for its reception in the slot. If the spring is incorrectly inserted there will be a liability of the breech screw being jammed in the gun.

#### Cam-Lever.

This lever is attached by a hinge bolt with keep pin; when the latter is removed, the bolt can be withdrawn.

#### Vent, T, Radial.

The T vent is secured by a nut and washer in the interior of the powder chamber; when these have been removed, the vent can be pushed out and withdrawn from the exterior of the gun.

### RIFLES, AIMING, M.-H. CHAMBER, EWART, B.L., 15-PR.

This apparatus is for use with the gun in imparting instruction in laying, and consists of the following parts:—

Rifle, aiming, M.-H. chamber, Ewart—				
Bands .. .. ..	Bronze; two to a set, front and rear, with key, buffer, and securing bolts.			
Barrel, rifle .. .. ..	M.-H. rifle barrel, with breech action and metal boss.			
Link, trigger .. .. ..	Bronze; with fixing screw.			
Cord, firing .. .. ..	White line, tarred; 2 yards long, with two hooks.			
Tube, aiming, M.-H. rifle.. ..	Including breech-piece, bushes (movable and fixed), set nut, and leather washer.			
Tube, aiming, 0·23-inch—				
Brush, cleaning .. ..				
Key, M.-H. .. .. ..				
Rod, cleaning.. .. ..				

### Method of Fitting, Adjusting, and Using the Apparatus.

The aiming rifle is fitted to the left side of the gun in the following manner:—

The two bands are placed over the exterior of the gun, the front band over the chase, and the rear band over the swell of the jacket immediately in front of the largest diameter, the distance between the inner faces of the bands being 27 inches. The bands are secured round the gun by fixing bolts. The muzzle of the rifle is passed through the hole in the arm projecting from the front band, and the breech is placed in the socket on the rear band and fastened with a key. A buffer spring, to lessen the strain on recoil, fits into the socket in rear of the rifle. A hole is made at the rear end of the socket to facilitate the extraction of the buffer spring.

To adjust the rifle on the gun, the latter is laid horizontally; the .23-inch aiming tube is then inserted in the bore of the rifle, sufficient length being allowed to project from the bore to admit of the application of a spirit-level to the tube, by which means the rifle is levelled so that the axes of rifle and gun are in parallel horizontal planes. The bands are then firmly screwed up, care being taken to see that they do not shift during the operation, in the event of which they must be slackened and re-adjusted.

Elevation is obtained by means of the gun sights and any error in line is corrected by use of the deflection scale.

The rifle is fired by means of the firing cord which is attached at one end by means of a hook to the loop of the trigger link, the other end of the cord being led through the bayonet joint of the T-vent to the firing number.

### DESCRIPTIONS OF CARRIAGES, LIMBERS, AND WAGONS.

- Carriages, field, B.L., 15-pr., Marks I, II.
- Limbers, field, B.L., 15-pr., Marks I, II.
- Wagons, ammunition, B.L., 15-pr., Marks I, II.
- Wagons, forge, R.A., Marks I\*, II, III.
- Limbers, wagon, forge, R.A., Marks II\*\*, II\*, III\*
- Wagons, store, R.A., Marks I, II.
- Limbers, wagon, store, R.A., Marks I\*, II\*.
- Wagons, ammunition, and store, R.A., Mark II\*.
- Wagons, artillery, Mark I\*.

## Carriage, Field, B.L., 15-pr., Mark I.

(Plate IV.)

The carriage consists of two side brackets, connected by transoms, two trunnion brackets, a trail eye, shell pockets, double screw elevating gear, shoe brakes, an axletree with 2nd class arms, a drag shoe, and two field wheels.

The side brackets are of flanged steel, joined by a steel plate riveted along the centre of the under side. A trail box is formed between the brackets, and is fitted with a wood block to contain a McMahon spanner, a pair of pincers, a spoke brush, a claw hammer, and a No. 9 oil can. A pad is fixed to the rear transom to support the breech of the gun, and thus prevent damage to the elevating gear when travelling.

The shell pockets are fitted, one to each side of the trail (near the axletree); each will hold two shrapnel shells, one case shot, and three cartridges. The shell pockets will not carry ammunition in addition to that carried in the ammunition boxes, and will only be filled—

(a) On active service, when in the judgment of the battery commander it is desirable to be prepared for immediate action.

(b) At practice camp, or drill, when necessary for the rehearsal of (a).

The trunnion brackets, which are of cast steel, are formed at the bottom to receive the axletree, and at the top with bearings for the gun trunnions.

The trail eye, No. 15, is of wrought iron, the eye being fitted with a movable piece of hard steel.

The elevating gear consists of an inner and outer screw, right, and left handed, bevel pinions, and handwheel, the whole being supported by an oscillating bracket, which works in bearings fixed to the brackets. The handwheel for working the gear is on the right side of the carriage.

The brake consists of two brake shoes, two steel wire ropes, two sets of suspending chains, and two drag washers with Q link. The brake shoes (which are in one steel forging, with the sides splayed out to the front) are attached to the sides of the carriage near the trail eye, by the wire ropes; the inner sides are connected by the suspending chains to the axletree, and when in use the outer sides are connected with the drag-washer. The drag-washer has a loop for use with the drag-rope, and on the opposite side, a Q link, or sliding hinged hook, similar to that used for traces.

In action, the shoes are placed on the ground, behind, and against the wheels, and the outer suspending chains are connected to the drag-washers. On recoil, the wheels of the carriage run on the brake shoes, the steel wire ropes being of sufficient length to ensure the wheels riding on the shoes during recoil. On running up the wheels leave the shoes, which remain in position for the next recoil. When not in use, the shoes and outer chains are hung on hooks fixed to the axletree for the purpose (the loop of the chain being first placed on the hooks and the shoe being turned over before it is hooked up), and the wire rope on to hooks on either side of the trail.

The axletree, which is 2nd class, "C," No. 37, is connected to the side brackets by two tensile stays.

For travelling, drag shoe No. 7 is provided; it is attached by a No. 18 drag chain to the underside of the trail, and when not in use is hung on a hook fixed to the breast of the carriage, the drag chain being supported on a hook on the side of the trail.

The wheels\* are 2nd class, "C," No. 42,† 5 feet in diameter, with metal flanges, pipe box, back and front spokes, and a 3-inch tire with rounded edges.

The flanges—which are front and rear—are cast with recesses on the inside to receive the spokes, the feet of which rest partly on the bottom of the recesses and partly on the pipe box. The flanges are connected by 14 round bolts, each of which passes through the foot of a spoke. The pipe box is secured to the back flange by two round tapered keys, the smaller ends of which are riveted over. The front and back spokes are not interchangeable.

The carriage is furnished with axletree seats, fitted with guard-irons and leather guards; the seat is supported on three spiral springs, fitted on either side of the trail. A sliding step for each seat is fitted on the underside of the axletree.

A traversing handspike, which is also used as a rammer, fits into a socket between the brackets near the trail eye; in travelling, it is strapped on the left bracket.

The carriage is furnished with locking plates, and fitted to carry two aiming posts and small stores, as shown in packing diagram A.

### Carriage, Field, B.L., 15-pr., Mark II.

(Plate V.)

The carriage consists of two side brackets, a trail eye, a top carriage, with hydraulic buffer and gun cradle, double screw elevating gear, shoe brakes, shell pockets, an axletree with 2nd class arms, and two field wheels.

The side brackets are of flanged steel, connected by transoms, stays, and a trail eye.

The trail eye (No. 16) is of wrought iron, the eye being fitted with a movable piece of hard steel.

The top carriage consists of two steel guides connected by transom guides and a tubular stay; it is pivoted at the front to the axletree, and supported at the rear by the elevating screw. The gun is a close fit in the gun cradle, to which it is secured by capsquares fitting over the trunnions. The breech of the gun is connected with a rear sliding bracket, which, together with the cradle, slides in guides formed on the upper part of the top carriage. The top carriage is fitted with a hydraulic buffer to admit of the gun recoiling axially, and so to lessen the shock due to firing on the main carriage. The hydraulic buffer is connected to the top carriage by trunnions, and the piston rod, which passes through both glands of the hydraulic buffer, is attached to the rear sliding bracket. The gun recoils about 4 inches on the top carriage, during which the motion is gradually imparted to the whole structure, thus lessening the strains upon it due to firing. The gun is returned to the firing position by volute springs on the front part of the piston rod.

The hydraulic buffer consists of a cylinder, a piston with rod, and front and rear glands. Each end of the cylinder is formed to take a U-leather, metal ring, cotton packing, and gland. A small spring bolt fitted to the buffer engages the rear gland to prevent it working loose, the front gland being held in position by the pressure of the volute springs. The bore of the cylinder is slightly tapered so that the space around the piston, for the flow of the liquid, varies

\* Those wheels are interchangeable with those of the limber and ammunition wagon.

† In some instances No. 36 wheel has been issued.

during recoil; by this means an approximately constant pressure is maintained in the buffer throughout its stroke. The front gland is made to fit into a recess in the piston so as to form a small hydraulic cushion which prevents injury to the buffer by concussion caused by the return of the gun.

The elevating gear, shoe brakes, shell pockets, and drag-shoe, and chain, are generally similar to those described for the Mark I carriage.

Axletree seats, furnished with guard irons and sliding steps, are fitted on each side of the brackets, similar to the Mark I carriage.\*

The axletree, which is 2nd class, "C," No. 95, is passed through octagonal holes in the front brackets, and is secured into position by two seat brackets. The axletree is connected to the brackets by tensile stays.

The wheels† are the same as those described for Mark I carriage (p. 13).

The carriage is furnished with locking plates, and fitted to carry a traversing handspike, two aiming posts, a No. 9 oil can, and various small stores, as shown in packing diagram B.

### Limber, Field, B.L., 15-pr., Mark I.‡

The limber consists of a steel frame, a limber hook, a 2nd class axletree, a pole with draught chains and pole bar, two swingletrees, an ammunition box, and two field wheels.

The frame consists of four futchels, connected by front and rear plates; platform and footboards are fitted to the top, and draught hooks for the swingletrees to the front of the outer futchels. At the rear brackets are fitted on each side of the limber hook to carry a shelf, to facilitate the setting of fuzes.

A wrought-iron limber hook (No. 3), with removable steel, is riveted to the inner futchels and the rear connecting plate.

The axletree, No. 38, is of weldless steel tube; it is fixed in flanges, which are attached to the futchels.

The fittings for draught consist of a pole (12 feet 7 inches long); two No. 7 swingletrees§ (2 feet 4 inches long) fitted in the centre and at each end with a steel socket having a loop; a No. 2 supporting bar (3 feet 2½ inches long), with a steel socket, with loop at each end and two No. 2 draught chains, each about 2 feet 10½ inches long, with a ring at one end and a Q at the other.

The ammunition box is of wood; it is fitted with two lids, a striking plate to take the blow of the trail when limbering up, and cranked guard-irons fitted with leather guards. The box is fitted internally with partitions, and arranged to carry a supply of shrapnel shell, case shot, fuzes, friction tubes, and cartridges. The projectiles are carried upright, the bottoms fitting in aluminium trays,|| which are fixed to the bottom of the box; they are steadied at the top by wooden blocks which fit between their heads, and are held in notches, lined with aluminium (in the top of the partitions and the ends of the box), by wood battens attached to the lid. Two cartouches, each holding 20 cartridges, are carried in compartments in the centre of the box. A leather holdall for gun fittings, &c., is

\* On the Mark II carriage the drag shoe is hung on a hook on the right side (travelling) of the axletree.

† These wheels are interchangeable with those of the limber and ammunition wagon.

‡ The limbers for carriage and ammunition wagon are alike.

§ Will eventually be replaced by the steel swingtree, No. 10.

These aluminium trays are being replaced by wood blocks.

secured to the inside of each lid, and fittings are attached to the "off" lid to carry a wrench ratchet.

The limber is fitted on the underside to carry a 3 lb. grease tin and a No. 3 lubricating can, and on the "near" side of the platform board a steel box for telescopic sight.

The wheels\* are 2nd class, "C," No. 35, 5 feet in diameter, with steel nave, removable pipe box, and a 3-inch steel tire with rounded edges. The nave consists of two flanges of corrugated steel, which are connected by 14 bolts, the inner flange is fitted with a steel ring to strengthen it, and the outer flange with a metal centering ring; the pipe box is passed through the flanges, and is secured by a nut, which is prevented from working loose by a spring fixed to the pipe box. A spanner, No. 93, is provided for removing the pipe box; it is carried on the "near" side of the ammunition box of the wagon.

The limber is fitted to carry various stores, as shown in packing diagram A.

One limber per battery will be fitted with loops for kicking straps.

#### + Limber, Field, B.L., 15-pr., Mark II.

(Plate VI.)

The Mark II limbers are similar to the Mark I, but differ in having deeper futchels. (For detail of stores, &c., see diagram of packing B.)

One limber per battery will be fitted with loops for kicking straps.

#### Wagon, Ammunition, B.L., 15-pr., Mark I.

The wagon consists of a steel frame, a hollow box perch fitted with trail eye, a drag shoe and ammunition box, a 2nd class axletree, and two field wheels.

The frame consists of two flanged sides connected by a rear plate and "channel" stays; platform and footboards are fitted to the sides and perch in the front, and at the rear brackets are fitted to carry a shelf to facilitate the setting of fuzes. Two wooden boxes, each carrying a 14 lb. grease tin, are fixed by bands to the underside at the rear.

The perch, which is connected to the frame, is made of steel plate; it is fitted with a perch eye (No. 7), with removable steel locking plates and a loop for the attachment of the drag shoe and chain. The drag shoe, when not in use, is carried on the top of the perch, secured by a leather strap.

The ammunition box is generally similar to that described for the limber, but differs in the arrangement of the internal fittings. Two cartouches, each holding 32 cartridges, are carried in suitable compartments.

The axletree (No. 38) and wheels† (No. 35) are the same as those described for the limbers.

The wagon is fitted to carry a No. 93 spanner and various stores, as shown in diagram of packing A.

#### Wagon, Ammunition, B.L., 15-pr., Mark II.

(Plate VI.)

The Mark II wagons are similar to the Mark I, differing only in having deeper futchels. (For arrangement of stores, see diagram of packing B.)

\* These wheels are interchangeable with those of the gun carriage.

† The limbers for the ammunition wagon and carriage are alike.

*Dimensions, &c.*

	Carriage and Limber.		Wagon and Limber.	
	Mark I.	Mark II.	Mark I.	Mark I.
Height to axis of gun (carriage) ..	3' 3 $\frac{1}{2}$ "	3' 4"		
Length of wagon and limber ..	25' ..	25' ..	22' 4"	22' 0"
carriage and { with gun ..	25' 7 $\frac{1}{2}$ "	25' 0"	..	..
limber { without gun ..	22' 2 $\frac{1}{2}$ "	22' 2"	..	..
Axletree .. .. ..	6' 3"	6' 2"	6' 3"	6' 2"
Length between axletrees .. .. ..	8' 1 $\frac{1}{2}$ "	8' 1"	8' 0"	8' 0"
Greatest projection beyond track of wheels.	0' 6 $\frac{1}{2}$ "	0' 6"	0' 6 $\frac{1}{2}$ "	0' 6"
Maximum width .. .. ..	6' 3"	6' 2"	6' 3"	6' 2"
Wheels { track .. .. ..	5' 2"	5' 2"	5' 2"	5' 2"
diameter .. .. ..	5' 0"	5' 0"	5' 0"	5' 0"
Angle { of trail (carriage) .. ..	27°	23° 15"	..	..
of lock .. .. ..	55°	50°	62 $\frac{1}{2}$ °	62 $\frac{1}{2}$ °
Upsetting angle .. .. ..	35°	35°	33°	33°
Elevation, maximum (carriage) .. ..	16°	16°	..	..
Depression .. .. ..	8°	5°	..	..
Space required " to turn in " .. ..	30' 6"	30' 0"	29' 3"	29' 0"
for shipment (without gun) .. ..	5 '63 tons	5 '5 tons	5 '95 tons	5 '64 tons
Tonnage { for transport in boats (with gun). .. ..	11 '60 tons	11 '66 tons	11 '51 tons	11 '51 tons
Rectangular space occupied in boats {	14' 3 $\frac{1}{2}$ " x 6' 2" x 5' 3"	14' 5" x 6' 2" x 5' 3"	14' 0" x 6' 2" x 5' 3"	14' 0" x 6' 2" x 5' 3"

*Weights (approximate).*

(Packed, and with personal equipment and detachment.)

	Carriage and limber.		Wagon and limber.	
	Mark I.	Mark II.	Mark I.	Mark II.
Carriage and limber .. ..	cwt. qr. lb. 41 2 0	cwt. qr. lb. 41 3 4	cwt. qr. lb. ..	cwt. qr. lb. ..
Wagon and limber .. ..	.. ..	.. ..	42 3 0	42 3 16
Carriage { weight on two fore wheels and limber .. ..	21 0 0	21 0 2	.. ..	.. ..
"      " hind .. ..	20 2 0	20 3 2	.. ..	.. ..
Wagon { and " fore .. ..	.. ..	.. ..	20 2 0	20 2 7
"      " hind .. ..	.. ..	.. ..	22 1 0	22 1 9
Carriage (trail on ground) .. ..	22 2 0	22 2 20	.. ..	.. ..
Limber { carriage .. ..	19 0 0	19 0 12	19 0 0	19 0 12
wagon .. ..	.. ..	.. ..	.. ..	.. ..
Wagon (perch on ground) .. ..	.. ..	.. ..	23 3 0	23 3 4
Weight at end of pole (limbers)* .. ..	0 1 0	0 1 0	0 1 0	0 1 0
Pressure of perch on ground (wagon). .. ..	.. ..	.. ..	2 0 14	2 0 22
Pressure of trail on ground (carriage). .. ..	1 3 0	2 0 0	.. ..	.. ..
Wheel { No. 35 (limbers and wagon) .. ..	1 3 4	.. ..	.. ..	.. ..
wheel 42 (carriage) .. ..	2 0 13	.. ..	.. ..	.. ..

\* In the earlier issues the weight at the end of the pole is practically nil.

## Wagon, Forge, R.A., Mark I\*.

## Limbers, Wagon, Forge, R.A., Mark I\*\*.

These wagons and limbers are the Mark I pattern, converted to conform as far as possible to the Mark II pattern. Runners and guides are fitted to the tailboard and bottom of the wagon, to carry either the Mark IV field or the Mark II G.S. forge. The wagon is fitted with four under boxes, two lantern boxes, one for two distinguishing lanterns,\* and one for two folding lanterns.

The limber for this wagon is the Mark I pattern, fitted for pole draught, and with the limber box altered internally to conform to the limber box of the Mark II\* and III\* limbers.

The pole draught will be the same as that for the carriage and wagon limber.

The wheels are 2nd class, "C," No. 36.

The wagon and limber can be packed to carry either the stores of the Mark I or II equipments.

## Dimensions, &amp;c.

	ft.	in.
Total length with pole .. .. .. .. ..		
Maximum width .. .. .. .. ..		
Length between axles .. .. .. .. ..		
Wheels { track .. .. .. .. ..		
diameter .. .. .. .. ..		
Space required to turn in .. .. .. .. ..		
Angle of lock .. .. .. .. ..		
Upsetting angle .. .. .. .. ..		
Rectangular space occupied in boats .. .. .. .. ..		
Tonnage { for shipment .. .. .. .. ..		
,, transport in boats .. .. .. .. ..		

## Weights.

(Packed, including personal equipment.)

	cwt.	qr.	lb.
Wagon and limber .. .. .. .. ..			
Wagon and { weight on two fore wheels .. .. .. .. ..			
limber .. .. .. .. ..			
Wagon (perch on ground) .. .. .. .. ..			
Limber .. .. .. .. ..			
Weight at end of pole .. .. .. .. ..			
Pressure of perch on ground .. .. .. .. ..			

## Wagon, Forge, R.A., Mark II.

## Limber, Wagon, Forge, R.A., Mark II\*.

The wagon consists of a frame of angle iron, a perch, and an axle box built up on the box girder principle, and two field wheels.

\* Distinguishing lanterns are carried with ammunition columns only.

† These particulars will be issued hereafter.

The perch is formed of two pieces of "channel" iron connected by collar bolts, top and bottom plates, and a perch eye which is riveted between them at the front; it is fitted to carry an anvil and block on the top, and a drag shoe and chain on the "off" side. On the top of the perch two holes are drilled to receive a vice.

The frame of the wagon is boarded over, and fitted with side boards and movable head and tail boards, to form the body of the wagon.

The body is divided into two compartments by a cross partition. The hind compartment is covered with a lid which is hinged to the partition. The front compartment is covered by two removable cutting boards, and a narrow flap, which is hinged to the cover of the hind compartment. Two tool chests (one for smiths' tools and one for wheelers' tools) are carried in the front compartment, and a Mark IV\* field forge in the rear compartment.

The wagon is fitted with four under boxes, two lantern boxes (one for two distinguishing† lanterns, and one for two folding lanterns), and four bale hoops for a canvas cover.

The limber for this wagon is the Mark II pattern, fitted for pole draught, and with a limber box arranged internally for cans, boxes, and tins to carry the oil, soap, dubbing, &c., allowed for this equipment.

The pole draught is the same as that for the carriage and ammunition wagon limber.

The wheels are 2nd class, "C," No. 36.

The wagon and limber can be packed to carry either the stores of the Mark I or II equipments.

#### *Dimensions, S.C.*

Total length, with pole ..	..	..	..	..	..	}
Maximum width ..	..	..	..	..	..	
Length between axles ..	..	..	..	..	..	
Wheels { track ..	..	..	..	..	..	
diameter ..	..	..	..	..	..	
Space required to turn in ..	..	..	..	..	..	
Angle of lock ..	..	..	..	..	..	
Upsetting angle ..	..	..	..	..	..	
Tonnage { for shipment ..	..	..	..	..	..	
for transport ..	..	..	..	..	..	

#### *Weights.*

(Packed, including personal equipment.)

		e.wt.	qr.	lb.
Wagon and limber ..	..	..	..	..
Wagon and { weight on two fore wheels ..	..	..	..	..
limber { " hind "	..	..	..	..
Wagon (perch on ground) ..	..	..	..	..
Limber ..	..	..	..	..
Weight at end of pole ..	..	..	..	..
Pressure of perch on ground ..	..	..	..	..

\* This wagon is being altered to take the Mark II G.S. forge.

† Distinguishing lanterns are carried in the ammunition column only.

‡ These particulars will be issued hereafter.

## Wagon, Forge, R.A., Mark III.

## Limber, Wagon, Forge, R.A., Mark III\*.

The wagon consists of a frame of angle steel, a steel perch, a tubular axletree, and two field wheels.

The frame is fitted to carry four wood boxes, and a "Forge, G.S., Mark II"; the boxes are secured in position by nib irons and thumb screws; the two front boxes are fitted with drawers to carry smiths' and wheelers' tools, and the two sides are for carrying coal. The forge is placed between the coal boxes, and secured when travelling by leather straps and the tailboard of the wagon; when required for use the tailboard is turned down, and the forge, which is provided with rollers, is run out on the tailboard to facilitate removal. On the top of the front boxes are secured a block for the anvil, two lantern boxes (one for two distinguishing lanterns and one for two, folding lanterns), two picketing ropes, one grindstone, and two empty coal sacks. To the top of the "off" coal box, eight farriers' aprons are strapped.

The perch is formed of steel plate, bent so as to form a tapering box girder, and fitted with a perch eye; it carries an anvil. Two propsticks are fitted on the under side.

The axletree is tubular steel, 2nd class, "C," No. 38.

The wagon is fitted with four bale hoops, for a canvas cover. To the bale hoops four farriers' bags are strapped.

The limber is generally similar to the carriage limber, but is fitted with a limber box, internally arranged to carry cans, boxes, and tins, for the oil, soap, dubbing, &c., allowed for this equipment.

The wheels are 2nd class, "C," No. 36.

The wagon and limber can be packed to carry either the stores of the Mark I or II equipments.

*Dimensions, &c.*

Total length with pole ..	..	..	..	..	22' 9"	
Maximum width ..	..	..	..	..	6' 2"	
Length between axles ..	..	..	..	..	8' 1"	
{ track ..	..	..	..	..	5' 2"	
Wheels { diameter ..	..	..	..	..	5' 0"	
Space required to turn in ..	..	..	..	..	20' 4"	
Angle of lock ..	..	..	..	..	60°	
Upsetting angle ..	..	..	..	..	30½°	
Rectangular space occupied in boats ..	..	14' 2"	×	6' 2"	×	6' 9"
Tonnage { for shipment ..	..	..	..	..	7.066 tons	
for transport in boats ..	..	..	..	..	14.98 "	

*Weights.*

(Packed, including personal equipment.)

	cwt.	qr.	lb.
Wagon and limber ..	..	37	0 22
Wagon and { weight on two fore wheels ..	..	15	3 25
limber ..	..	21	0 25
Wagon (trail on ground) ..	..	23	0 12
Limber ..	..	14	0 10
Weight at end of pole ..	..	—	1 0
Pressure of perch on ground ..	..	2	2 15
		B	2

### Wagon, Store, R.A., Mark I.

#### Limber, Wagon, Store, R.A., Mark I\*.

This wagon is similar to the forge wagon Mark II, but the body is divided into three compartments, which are covered with lids. The front and centre compartments are fitted to carry stores, and the rear compartment a stationery box, the front of which can be let down on the tailboard (when the latter is supported by its chain) to serve as a writing desk.

The wagon is fitted on the top to carry a lantern box for two folding lanterns, two chests of collar-makers' tools, picketing ropes, luff tackle, and a camp stool.

The limber is the same as that described for the Mark II forge wagon, but the limber box differs in its internal fittings.

The wheels are 2nd class, "C," No. 36.

The wagon and limber can be packed to carry either the stores of the Mark I or II equipments.

#### *Dimensions, &c.*

Total length of pole .. .. .. .. ..	}
Maximum width .. .. .. .. ..	
Length between axles .. .. .. .. ..	
Wheels { track .. .. .. .. ..	
diameter .. .. .. .. ..	
Space required to turn in .. .. .. .. ..	
Angle of lock .. .. .. .. ..	
Upsetting angle .. .. .. .. ..	
Rectangular space occupied in boats .. .. .. .. ..	
Tonnage { for shipment .. .. .. .. ..	
for transport in boats .. .. .. .. ..	

#### *Weights.*

(Packed, including personal equipment.)

	cwt.	qr.	lb.
Wagon and limber .. .. .. .. ..			
Wagon and { weight on two fore wheels .. .. .. .. ..	}	*	*
limber { hind .. .. .. .. ..			
Wagon (perch on ground) .. .. .. .. ..			
Limber .. .. .. .. ..			
Weight at end of pole .. .. .. .. ..			
Pressure of perch on ground .. .. .. .. ..			

### Wagon, Store, R.A., Mark II.

#### Limber, Wagon, Store, R.A., Mark II\*.

This wagon is similar to the forge wagon, Mark III, but the body is fitted with four wooden boxes, secured by nib irons and thumb screws; the three front boxes are for carrying stores, and the rear box for stationery.

The stores carried on the top of the wagon are the same as those for the Mark I.

---

\* These particulars will be issued hereafter.

The limber is that described for the Mark III forge wagon, but the limber box differs in its internal fittings.

The wheels are 2nd class, "C," No. 36.

This wagon and limber can be packed to carry either the stores of the Mark I or II equipments.

*Dimensions, &c.*

Total length, with pole ..	..	..	..	..	22' 9"	
Maximum width ..	..	..	..	..	6' 2"	
Length between axles ..	..	..	..	..	7' 9½"	
Wheels { track ..	..	..	..	..	5' 2"	
Wheels { diameter ..	..	..	..	..	5' 0"	
Space required to turn in ..	..	..	..	..	29' 4"	
Angle of lock ..	..	..	..	..	60°	
Upsetting angle (packed) ..	..	..	..	..	29½°	
Rectangular space occupied in boats ..	..	14' 2"	×	6' 2"	×	7' 3"
Tonnage { for shipment ..	..	..	..	..	8·127	
Tonnage { transport in boats ..	..	..	..	..	16·089	

*Weights.*

(Packed, including personal equipment.)

		cwt.	qr.	lb.
Wagon and limber ..	..	..	..	..
Wagon and { weight on two fore wheels ..	..	..	..	..
limber { hind ..	..	..	..	..
Wagon (perch on ground) ..	..	..	..	..
Limber ..	..	..	..	..
Weight at end of pole ..	..	..	..	..
Pressure of perch on ground ..	..	..	..	..

**Wagon, Ammunition and Store, R.A., Mark II\*.**

(Plate VII.)

The body of this wagon consists of a framework formed by two sides, *a*, and two summers mortised into a front and rear earbed, *b*. This framework is strengthened by plates riveted on the inside; it is housed and bolted to a front bolster, *c*, a cross bar, *d*, and a rear bolster, *e*. In front and rear of the front bolster, front and rear wheel bolsters, *f*, are bolted to the summers, and to these three the upper wheel plate, *g*, is attached. The front bolster is shod with a friction plate, and is plated at the sides.

The body is supported over the hind axle upon two side stays of T-iron, and a cross stay of round iron. Each side stay rests in an axle block of oak upon the shoulder of the axletree, where it is secured by axletree staples, by a clip plate, and by the end of the cross stay, which latter serves as a coupling plate.

The frame is boarded over to form the bottom of the wagon, and movable sides, *A*, head-board, *B*, and tail-board, *C*, are fitted to it.

A locker is formed in front of the wagon body by a sliding partition. The lid of the locker is fitted with a raised box and driving seat, *k*, a back board, *l*, being hinged to it, and a footboard, *m*, to the head-board of the wagon. A small locker, *n*, is also formed between the summers underneath the rear of the wagon.

---

\* These particulars will be issued hereafter.

These wagons are now fitted with cranked guard-irons, and the driver's seat is made slightly higher for convenience in driving with long reins. The footboard is increased in length and width, and fitted with a long toepiece, and further supported by iron stays fitted to its under side and to the front earbed.

The fore carriage of the wagon is formed of four futchels, *o*, housed in and bolted to a splinter bar, *p*, and a cross-bar, *q*. An upper bolster, *r*, is bolted over, and an under bolster, *s*, beneath the centre of the futchels. A wheel plate is attached to the upper bolster, to the cross-bar, and to a small wheel bolster, *t*, placed in front. The upper bolster is shod with a friction plate, and both it and the lower bolster are strengthened by plates.

The frame of the fore carriage is supported over its axle in the same manner as the body over the hind axle.

The wagon is fitted for pole draught, which consists of a pole, bar supporting pole, two swingletrees, and two draught chains.

The body and fore carriage are connected by a main pin, which passed through bolster plates in the main bolsters, and is keyed beneath.

The footboard is of elm, the other boarding of yellow deal, and the remainder of the woodwork of the wagon of oak.

The fore wheels are 3 feet 4 inches in diameter, the hind 5 feet. The axles are 2nd class.

The wheels first issued with the wagons were:—

Fore, No. 33 }  
Hind, No. 32 } with wood naves.

Later issues of the wagons may be met with, having:—

Fore, No. 28 }  
Hind, Nos. 25, 27, or 39 } with metal naves.

Nos. 28 and 39 wheels will only be issued to replace existing wheels of other numbers as the latter become unserviceable.

The wagon is fitted to carry a spare fore wheel, a "pole, flag, distinguishing,"\* entrenching tools, carbines, and swords, and a drag shoe with chain, &c. A locking plate, *u*, is attached beneath the frame to prevent the fore wheel injuring the latter in wheeling on rough ground.

The following articles belong to the wagon, namely, five bale hoops, *x*, a waterproof canvas cover with the lashing rope, bar stay, three lashing ropes, to secure the spare wheel, and drag shoe with chain, and half-round grease tin.

The drag shoe is attached to a ram's horn hook fixed on the near side. The shoe, when not in use, is carried in a bracket on the side and secured by straps. In the plate the old manner of carrying it is shown.

The bale hooks are of ash, fitted with leather stops, and numbered from one upwards, commencing with the front hoop, a corresponding number being placed upon the wagon side at the upper staple for the bale hoop. The front hoop has also the register number of the wagon painted upon it.

The canvas cover is waterproofed, and has the register number of the wagon painted upon it.

The bar stay is of ash, to fit from side to side, and keep the sides from spreading out when the wagon is packed and the tailboard down.

The extreme load is 2 tons.

\* This pole is issued for ammunition columns only.

Weight	..	..	..	..	..	..	$20\frac{1}{2}$ cwt.
Tonnage	{	for shipment	..	..	..	..	4.659 tons.
	for transport in boats	..	..	..	..	..	12.839 "
Rectangular space occupied in boats	..	..	..	..	..	..	11' 4" x 6' 3".
Upsetting angle	..	..	..	..	..	..	30 degrees.
Angle of lock	..	..	..	..	..	..	103
Space required to turn in	..	..	..	..	..	..	23 ft. 7 in.

*Note.*—The stores carried in this wagon are laid down in the Tables of Equipment.

### Wagon, Artillery, Mark I\*.

(Plate VII.)

The wagon consists of a light-framed body, mounted on steel springs, with a lock under fore-carriage.

Four horses are employed to draw this wagon, instead of the six required for the ammunition and store wagon.

The fore-carriage is connected to the body by a ball and socket joint, which gives an easy movement to the wagon, and enables it to travel over rough ground without straining and twisting.

The wagon is fitted for pole draught, which consists of a pole, a bar supporting pole, two swingletrees, and two draught chains.

A driving seat (*a*) is provided, for use with pole draught. The front board is hinged to the body and is fitted with securing chains, to admit of its being turned down to form a footboard (*b*).

An auxiliary seat (*c*), which is placed across the wagon, is provided for convenience in carrying men when the wagon is not fully loaded. Both seats are removable, and when not in use are carried beneath the bottom of the wagon, where they are secured by suitable fittings.

Two removable partitions are supplied with each wagon; the front one and the front board form a locker; the hind one is intended to keep the load at the back of the wagon when it is not full, or to prevent the load slipping under the men's feet when the auxiliary seat is used.

When the front board is utilised as a footboard the wagon sides are held in position by the front partition, the top corners of which are fitted with iron clips or hooks to grip the sides for this purpose.

The partitions which are retained in position by cleats fixed to the wagon sides, can also be brought close together to form a front locker when the front board is turned down. When the rear partition is not required, it can be placed close up to the front one or be carried in any position where most convenient.

A small trap door is let into the floor of the wagon to give access to a metal grease box, which contains lubrication for the ball and socket joint. This box is fitted with a spring and plug, which forces the grease down a tube to the joint. The box is covered with a screwed top, and this should be occasionally removed and the box replenished with grease, especially before proceeding on a long journey.

The axletrees are hollow steel tubes, with second class arms. The outer faces of the drag washers are recessed, and the linch-pins are made with a shoulder, which runs in the recess, to obviate the use of linch-pin ties. A slot is formed in the washer, to allow of the withdrawal of the linch-pin.

The wheels are Nos. 38 and 37. They are second class; the hind

wheel is 5 feet in diameter, and the fore 3 feet 6 inches. They have 2½-inch tires and iron naves, with 11-inch pipe boxes.

The wagon is fitted with floating raves, bale hoops, and the usual fittings for camp stores and intrenching tools.

Extra staples are fixed near the centre of the sides, to carry the front bale hoops when long rein driving is resorted to, and small hooks (*d d*) are fixed on the rear part of the sides for the cover to be laced to, so as to keep it clear of the wheels.

The wagon is fitted to carry a spare fore wheel on the under side at the rear, also a spare subdivision wheel, by means of an axle arm which is fitted at the rear, and two spare subdivision limber poles on the raves.

The sides and ends are removable, and the floating raves are jointed, so that the whole can be conveniently packed for shipment.

The capacity of the wagon is 43 cubic feet, but the load must not exceed 15 cwt.

The wagon should be frequently examined, to see that the fittings, working parts, &c., are in proper condition, and that all nuts and bolts, which occasionally become loose through jolting, are properly tightened up, especially before and during a march.

Special care in packing the load of the wagon is desirable. The contents should be closely packed; the bulkiest and lightest portion being over the front wheels, and the general weight of the load should be central between the sides.

Weight	..	..	..	..	..	..	14½ cwt.
Tonnage	{	for shipment	..	..	..	..	4·729 tons.
		for transport in boats	..	..	..	..	14·308 "
Rectangular space occupied in boats:-							
12' 3¾" × 6' 2¼" × 7' 6", total height.							
Upsetting angle	..	..	..	..	..	..	29½ degrees.
Angle of lock	..	..	..	..	..	..	119
Space required to turn in..	..	..	..	..	..	..	29 ft. 2 in.

*Note.*—The stores carried in this wagon are laid down in the Tables of Equipment.

#### GENERAL INSTRUCTIONS FOR CARE AND PRESERVATION.\*

Care should be taken that all nuts and screws are properly tightened up; if removed, they should be slightly oiled before being replaced, and to prevent damage by the threads crossing, a few turns should be given by hand before using the spanner.

On no account should a hammer be used in removing the nuts or screws.

All bright parts should be kept clean, and slightly oiled to prevent rust, and such parts of the elevating gear of the carriage as are not in constant use should be coated with boiled linseed oil to preserve them from rust.

All working parts must be kept free from clotted oil and dirt, and properly lubricated.

*When painting the carriage or limber, especial care should be taken not to paint those surfaces over which motion, whether lineal or circular, takes place.*

\* For detailed instructions as to method of carrying out repairs, &c., see "Hand-book for Military Artificers."

Before travelling, the wheels and axle arms should be freed from grit, the latter well greased, and all nuts properly screwed up with the spanners provided for that purpose.

When the elevating gear is taken apart for cleaning, &c., great care must be taken that it is correctly replaced. When the elevating screw is at its lowest point, the breech of the gun—in the case of the Mark I carriage—and the sides of the top carriage—in the case of the Mark II carriage—must rest on the pad fixed to the rear transom, and stops on the side brackets, respectively.

**Wheels.**—Filling-in pieces often require re-setting and shortening, for the spokes shrink from back to front as well as across, and the filling-in pieces, not shrinking in the direction of their length, prevent the flanges from going home on the spokes, causing a shaky wheel. Filling-in pieces are not used in India. When spokes shrink across, the tire must be tightened up.

Broken or damaged spokes should be replaced at once.

As the axletree arms and pipe-boxes wear, leather washers should be used at outer end of axletree arm. Steel or iron washers are bad for this purpose, as they increase the wear of the arm and of the end of the pipe-box. In India, or whenever a leather band is used round the pipe-box, on which the feet of the spokes rest, it should be examined when the wheel is retired, and removed if found hard and dry; it should be thoroughly soaked in oil.

In wheels of the double-spoke pattern the “on” and “off” spokes are not interchangeable, and the feet of the spokes resting partly in sockets in the flanges and partly on the pipe-box; great care must be exercised that the slip-spoke is kept to its full length.

*The limbers must always be parked with the pole on the ground, and great care must be taken in limbering up (when the horses are not harnessed in) that the pole is not allowed to rise above its horizontal position.*

#### Special for Mark II Carriage.

**Hydraulic Buffer.**—The buffer must always be quite full, or great damage will be done to the carriage when the gun is fired. Always before firing, and periodically at other times, the guns should be depressed, and the filling-hole plug removed to see if the oil shows at the filling hole; if not, more oil should be run in until it does show, and the plug replaced.

Great care must be taken that no dust or gritty matter is poured in with the oil. If any leakage of oil takes place at the glands these must be tightened, care being taken that before the rear gland is turned its securing bolt is first pressed down, and afterwards that it is properly locked in its new position. If this will not stop the leakage the buffer must be removed from the top carriage and its packings renewed.

If the front glands are loose oil will escape, and the end of the piston rod will strike against the transom and indent it, probably causing a jam.

To remove the buffer.—Depress the gun as far as possible and remove the trunnions of the buffer, one number at the breast of the carriage holding up the front end of the piston rod; then lower the front end of the piston rod until it clears the axletree, disconnect the rear end of the piston rod from the sliding bracket, one number taking the weight, and remove the buffer to the rear.

To pack the front gland.—Empty the buffer, unscrew the stop at the end of the piston rod and remove the volute springs. Unscrew the inner gland and slip it along the piston rod. Replace the

defective packing with fresh material, which must be well saturated with Russian tallow before insertion. If the leather packing requires renewal, it must be removed either by moving the piston rod or by unscrewing the outer gland; and in introducing the new leather care must be taken to preserve the edges from injury.

To pack the rear gland.—Remove the volute springs in the manner described. Pull the piston up to the rear end of the cylinder. Unscrew the gland and slip it along the rod, and pack the gland as before described. If the leather packing requires renewal, and cannot be removed by working the piston rod, knock out the pin retaining the cross head, and unscrew the latter. Remove the outer rear gland, and pull the piston rod out of the cylinder.

When placing the volute springs on the piston rod in the parting plates both ends should be at the top, so that they can be seen should they jump out; the boss of the parting plates should point towards the breech, and the nut securing the springs on the rod should be screwed on until three threads project through the nut. Care must be taken when removing the volute springs to prevent them jumping out to the front and injuring someone.

If, after recoil, the gun is not forced back into the firing position, increased spring power can be obtained by tightening up the nut at the forward end of the piston rod.

## PROJECTILES.

(Plate VIII.)

Nature.	Diameter.		Length.	Bursting charge.		Weight filled and fuzed.
	Body.	Band or Studs.		Nature.	Weight.	
Shell, Shrapnel	Mark I ... ...	2·97	3·035	9·8	R.F.G. <sup>2</sup>	1½ oz. 15 oz. 14 13
	Mark II ... ...	2·97	3·035	9·0	R.F.G. <sup>2</sup>	1½ oz. 14 0
Shot, case, Mark III ... ... ...	2·9	...*	8·0†	...	...	12 8

\* Diameter { Over front corrugations, 2·96'.  
" rear 3·08".  
† Over handles—Length over body, 8·5".

### Shrapnel Shell.

*Mark II.*—The body of the shell is of forged steel. At a distance of .45 inch from the base, a groove is turned; three ridges project on the groove, and six axial chisel marks are cut across the ridges for the driving band to impart rotation to the shell.

The head of the shell is made of charcoal iron, or Bessemer steel, struck with a radius of one and half diameters; is truncated and screwed to receive a gunmetal socket, the latter being screwed to the G.S. taper.

The driving band is of copper, and is pressed into the groove round the shell.

A cap of sheet-iron plate, tinned, is fitted in the base, to contain the bursting charge.

The shell is filled with about 200 mixed metal balls, 35 per lb.

(contained in a wire cage),\* the interstices being filled with resin; deficiency in the weight, in manufacture, is made up by adding buck shot. The metal balls are supported by a steel disc, which is placed on the shoulder in the bottom of the shell.

A brass or gunmetal tube is fitted in the centre of the shell; the lower end of the tube is screwed to receive the steel disc, and the upper end, which is prepared internally to receive a primer, is secured to the socket by means of a gunmetal nut.

The shell is lined with brown paper.

The head of the shell, which is fitted with a felt washer, is attached to the body by six brass screws, six steel pins being also inserted to prevent the head twisting. On top of the balls is placed an iron disc, which is secured to the head by steel pins.

*Mark I*, of which no more will be manufactured, is generally similar to *Mark II*, except that the former is heavier, slightly longer, is fitted with a wood block in the head, and the primer fits in the socket instead of in the central tube. *Mark I* shell will be used up at practice camps.

The general dimensions and form of the shell are shown on the plate.

The shell should only be carried fuzed:—

(a) On active service, when in the judgment of the battery commander it is desirable to be prepared for immediate action.

(b) At practice camp, when necessary for the rehearsal of (a).

It must be remembered that the fuzes, when once taken out of their cylinders, will gradually deteriorate. Shell should, therefore, not be fuzed earlier than is necessary.

#### Case Shot.

The case is made of sheet tin, corrugated in three places, lapped and soldered together.

The bottom is of sheet tin, soldered to the sides of the case. A ring of sheet iron is riveted to the bottom of the case, outside. The case has a lining of zinc (in three segments), and a disc of sheet iron is laid loose, inside the lining.

The top is made of sheet iron, tinned, and is fitted with an iron handle for lifting the shot.

The case contains about 300 mixed metal balls (34 per lb.), the interstices being filled with an equal proportion of clay and sand.

#### Drill Shell.

The drill shell is made of cast iron; it is smaller in diameter than the shrapnel shell, and with a front copper band 6·25 inches from the base, to prevent the iron of the shell coming into contact with and injuring the bore. Both copper bands are plain, and are small enough to allow of the shell being rammed through the gun.

#### Fixing Plugs and Fuzes.

All shell for field service are issued filled; when, however, it is necessary to remove metal fuzes or plugs, they will be slightly lubricated (with Field's grease at home stations, and with black grease at stations abroad) before being replaced in the shell.

---

\* In future manufacture tin cylinders will be used.

### DISTINGUISHING MARKS.

Shrapnel shell is painted with a red tip 1 inch deep, and being made of steel, they have also a white band  $\frac{1}{2}$  inch wide, immediately below the red tip. F.S. will be stamped on base of forged steel shell.

Certain issues have been made with the bodies of the shells painted black, and the fuze hole plugs painted red, but in future the bodies of these shell will be painted lead colour, and the fuze hole plugs black, so as to afford a ready means of distinguishing them from B.I. 12-pr. 6 cwt. shrapnel shell.

Filled shell will also have a red band immediately below the white band, and will be marked in red letters  $\frac{1}{4}$  inch long, as follows :—

- (a) The monogram of the station, except when filled by the battery.
- (b) The date of filling.

Projectiles which are to be used for practice only, will be marked with a yellow band,  $\frac{1}{2}$  inch wide, round the body.

### EXAMINATION OF FILLED SHELLS.

The examination of filled shells will only be carried out by an inspector of warlike stores.

(For details, see Magazine Regulations.)

### FUZE, TIME AND PERCUSSION, NO. 56, MARK IV.

(Plate IX.)

The fuze consists of the following parts, viz. :—Body, detonator plug with detonator, percussion pellet, spiral spring, base plug, safety pellet, brass ball, composition ring, dome, brass washer, cap, two safety pins, and two leather washers.

The *body* is made of gunmetal, screwed at the lower end to G.S. fuze hole gauge. It is bored from the bottom to receive a percussion pellet and base plug. Two holes are bored beyond the recess for percussion pellet, one for the detonator plug, the other for the safety pellet.

The *detonator plug* is made of gunmetal, screwed on the outside and bored to receive a detonator.

The *detonator* is made of sheet copper, charged with  $3\frac{1}{2}$  grains of detonating composition ; the centre hole in the bottom is covered inside with a brass disc. A tinfoil disc goes on the surface of the composition, and over it a copper disc with four perforations, which is secured by turning over the lugs on the edge of the detonator body. The hole bored for the detonator plug is continued above it to form a small magazine filled with F.G. powder. In the top of the body is bored a recess to contain a perforated pellet of pressed pistol powder, which communicates with the magazine by a hole bored at right angles to the axis of the fuze. The stem on the body is screwed on top to take the cap, two grooves being cut in the top end of stem to receive the feathers on the brass washer. A groove is cut in the top face of body, close to the stem, and half way round it, and a gas escape hole bored obliquely through the body into the groove. A

small tablet of fine white paper is secured with shellac to the body of the fuze over the perforated powder pellet, and over it, two washers of fine white paper and calf-skin are secured with shellac, a hole being cut through the washers and tablet immediately over the powder pellet.

The *percussion pellet* is made of gunmetal, and has a slot cut in the side for the safety pellet and ball to fall into when set in action. A hole is made transversely through the pellet into which fits the brass retaining bolt, held in position by a brass spiral spring. The pellet contains a powder charge of F.G. powder. A small set screw, in the wall of the recessed interior of the body, fits into a slot cut in the percussion pellet to prevent it from turning in flight. A spiral spring, made of brass wire, is placed between the percussion pellet and detonator plug.

The *base plug* is made of gunmetal, with a conical hole bored in it, and closed at the bottom by a shalloon disc and brass washer spun in; it contains a perforated pellet of pressed powder, secured by a brass washer spun over on top.

The *safety pellet* is made of brass, and has a slot cut in the side to clear the brass ball. It is inserted in the body and suspended by a thin copper wire passing through holes in the fuze and pellet; the ends of the holes are closed by small lead plugs. A hole is also bored in the upper part of the pellet and body of fuze for the safety pin to pass through.

The *composition ring* is made of gunmetal, having a chamber on one side, and three projections on the inside to keep it concentric with the stem of the body. The chamber is bored and fitted with a hammer containing a steel needle, which is suspended by a copper wire over a patch of detonating composition. A safety pin also passes through the hammer and chamber. The composition ring has a groove turned on the underside and filled with composition, and this groove is connected with the hammer chamber by a lighting hole. The outside of the ring is graduated from 0 to 18, each division being subdivided into halves and quarters, with a broad arrow at the point where the groove is interrupted by a bridge soldered in.

The *dome* is made of sheet brass.

The *washer* is also made of sheet brass and fits over the top of the stem; it is to prevent the dome from turning and altering the setting of the fuze when screwing up the cap.

The *cap* is made of gunmetal, hexagonal in form, and screws on the stem of the body.

The fuze is stamped **T** on the composition ring close to the time safety pin, and **P** on the body close to the percussion pin.

If the fuze is required to act as a percussion fuze only, the **P** pin should be withdrawn and the **T** pin left in position; otherwise both pins should be withdrawn.

It must be remembered that it is dangerous to move loaded guns if the **T** pins have been withdrawn from the fuzes.

The fuze should be set before the safety pins are withdrawn.

To set the time arrangement, the cap is loosened with the "key, fuze, universal," and the ring moved round until the graduation ordered is exactly in line with the arrow on the body; the fuze is then clamped by screwing down the cap as tightly as possible, care being taken that the ring and dome have even bearings.

The safety pins should not be withdrawn till the moment of loading.

*Action.*—On discharge, if the time safety pin has been withdrawn,

the hammer sets down, shearing its suspending wire, and igniting the time ring, which burns until it comes over the hole in the leather and paper discs, when it ignites the pellet and so flashes down through the radial magazine, detonator pellet, and base plug, and into the shell.

If the percussion pin has been withdrawn, the safety pellet sets down, shearing the suspending wire, the brass ball falls down into the space over the safety pellet. The centrifugal bolt, owing to the rotation of the shell, releases the percussion pellet, which, on impact, flies forward and ignites the detonator, which flashes through the percussion pellet and base plug into the shell.

### CHARGES.

(Plate X.)

The cordite cartridge is made of red shalloon,  $14\frac{3}{4}$  to  $15\frac{1}{4}$  inches long, sewn with one row of silk, the bottom circular, and sewn with two rows of silk. The charge consists of  $15\frac{3}{4}$  oz. cordite, size 5, made up in a bundle, and tied in five places with two turns of silk twist. Two drams of guncotton yarn are wound round the bundle at each end, the centre of the yarn being 1 inch from the end of the cordite. The cartridge is choked with silk twist. The dimensions are :—

Length..	..	..	..	11·5 inches.
Diameter	..	..	..	1·9     ,,

The saluting charge is 1 lb. 8 oz. blank (L.G., R.L.G., or R.L.G.<sup>2</sup>) in a cartridge of No. 1 silk cloth, choked with silk twist, hooped with three silk braids, and with a silk braid loop attached to the bottom for removing it from the gun, if necessary. It is conical in form to prevent its being pushed beyond the vent, which projects a little into the bore.

### Drill Cartridge.

This cartridge is made of a block of wood, with a hole bored in the centre, which is filled with lead to bring the cartridge to its proper weight ( $15\frac{3}{4}$  oz.). It is covered with raw hide. A handle of spun yarn is passed through a hole, made near the top, and spliced.

Diameter	..	..	..	1·9 inches.
Length	..	..	..	10·75     ,,

*Note.*—Batteries practising either with blank cartridges or projectiles, should leave their drill shell and cartridges in camp or barracks.

The tampon is not to be placed in the gun except in the gun park.

## TUBES.

## T Friction Tube, Mark I.

(Plate XI.)

The form and general dimensions of the tube are shown on the plate, and consists of the following principal parts:—Body (*a*), head (*b*), ball (*d*), plug (*e*), friction wire (*f*).

The head is of gunmetal, the body of solid-drawn brass, the ball of soft copper, and the friction bar of doubled copper wire, the bight being formed into a loop, and the ends twisted together and roughened. A hole in the head of the tube over the friction wire is charged with about 2 grains of detonating composition, in the form of a paste, laid over the roughened part of the friction wire. A gut skin disc (*g*) is placed over the composition, and a shellacked cork plug (*h*) inserted over the disc, the hole being filled up flush with shellac cement. The body is charged with 8 grains of pistol powder, and is closed with a shellacked cork plug (*h*) covered with shellac cement.

A brass pin (*c*) is inserted to prevent the body becoming unscrewed. The upper part of the body has a central perforation, which is enlarged in its lower part into a conical recess. The ball (*d*) is placed in this recess, and is retained therein by a screwed plug (*e*) pierced by three fire holes.

On the withdrawal of the friction bar the detonating composition is ignited, and the flash, passing down the perforation in the head and through the plug, fires the powder charge. The ball is driven upwards by the explosion and seals the tube. This, together with the mode in which the tube is held in the special vent employed with it, prevents the rush of gas through the vent.

The body is lacquered inside and outside.

The tubes are issued in square tin boxes, 10 in a box. Both the top and bottom of the box are removable, being secured by soldered bands, and the tubes are so arranged that five may be withdrawn from the top and five from the bottom.

*Note.*—Tubes, after firing, are to be returned to Woolwich, to be repaired and refilled; they should be immersed in mineral oil within 24 hours after firing, for which purpose  $\frac{1}{2}$  gallon of oil per 100 tubes—of which 2 oz. ( $\frac{1}{6}$ th pint) would be used up in the treatment—is allowed.

## Tubes, Friction, Copper, Solid Drawn, Special (Mark I.).

The tube, which is for use with radially T-vented field guns when firing blank charges, is made of solid drawn copper, and has a solid head; it is furnished at the upper end with a solid drawn nib-piece, which is secured in the tube by solder. A hole is provided in the underside of the nib-piece to admit of the flash from the detonating composition communicating with the powder in the tube. The lower end of the tube is closed by means of a cork plug secured by shellac.

The total length of the tube is 1·6 inches.

The tubes are packed 25 in a tin box.

## T Friction Tube, Drill, Mark I.

*(Plate XI.)*

The drill tube is made of hardened steel, of the same external shape as the Service tube. The head of the tube is grooved to receive a hardened-steel spring, which is attached in the groove by a screw from the under side of the head. The end of the spring is bent down to nearly meet the bottom of the groove, which is raised to form a jaw, through which the hook of the lanyard can be drawn by a pull of about 50 lbs.

Total length of both tubes .. .. 1·9 inches.

**Range Table for 15-pr. B.L. Gun, Mark I.**  
Based on Practice of 21 and 22.5.95.

Minute 39.421.

Charge ...	weight, 15½ oz.	Projectile { nature, 15-pr. shrapnel shell, Mark II. { weight, 14 lb. 1 oz. Muzzle velocity, 1,574 f.s. Nature of mounting, travelling, field, Mark I. Jump, + 18 minutes.
	gravimetric density, $\frac{118.85}{0.233}$ .	
	nature, size 5/11, cordite.	

Remaining velocity.	5 mins. elevation or deflection alters point of impact.			Slope of descent.	Elevation.	Range.	Fuze Scale, for Time and Percussion fuze, Mark IV.	50 per cent. of rounds should fall in			Time of flight.
	Range.	Laterally or Vertically.	Deflection for drift (telescopic sight.)					Length.	Breadth.	Height.	
f.s.	yards.	yards.	min.	in —	° /	yards.	—	yards.	yards.	yards.	seconds.
1530	63	0·14	..	1 in 381	0 9	100	—	...	...	...	0·23
1498	63	0·29	1	" 214	0 3	200	—	...	...	...	0·46
1449	63	0·43	1	" 149	0 5	300	1	...	...	...	0·68
1409	63	0·58	1	" 110	0 14	400	1	...	...	...	0·91
1370	63	0·72	2	" 86	0 23	500	1	17	0·36	0·20	1·13
1332	63	0·87	2	" 72	0 32	600	2	17	0·36	0·27	1·37
1298	62	1·01	2	" 61	0 41	700	2	17	0·36	0·35	1·60
1264	61	1·16	2	" 54	0 50	800	2	18	0·36	0·43	1·84
1232	60	1·31	2	" 46	0 59	900	3	18	0·36	0·50	2·07
1201	59	1·45	3	" 40	1 8	1000	3	19	0·36	0·58	2·31
1171	56	1·66	3	" 35	1 17	1100	4	19	0·37	0·66	2·55
1144	53	1·74	3	" 31	1 27	1200	4	20	0·37	0·74	2·79
1117	51	1·89	3	" 27	1 38	1300	4	20	0·37	0·83	3·04
1093	49	2·03	3	" 23	1 48	1400	5	21	0·37	0·93	3·28
1071	47	2·18	3	" 20	1 58	1500	5	21	0·37	1·03	3·54
1033	45	2·32	4	" 18	2 9	1600	6	22	0·38	1·14	3·80
1035	43	2·47	4	" 17	2 20	1700	6	22	0·38	1·26	4·06
1021	41	2·61	4	" 16	2 32	1800	6	23	0·38	1·39	4·33
1006	39	2·76	4	" 14	2 44	1900	7	23	0·38	1·53	4·60
992	33	2·91	4	" 13	2 56	2000	7	24	0·38	1·08	4·87
977	37	3·05	5	" 12	3 9	2100	8	24	0·39	1·82	5·16
964	37	3·20	5	" 11	3 22	2200	8	24	0·47	1·97	5·45
952	36	3·34	5	" 10	3 33	2300	9	25	0·58	2·14	5·75
940	35	3·49	6	" 10	3 50	2400	9	25	0·70	2·34	6·05
923	35	3·63	6	" 9	4 4	2500	10	26	0·85	2·53	6·37
916	34	3·78	6	" 9	4 19	2600	10	26	1·02	2·76	6·71
904	33	3·92	7	" 8	4 34	2700	11	27	1·18	3·00	7·04
893	33	4·07	7	" 8	4 50	2800	11	27	1·36	3·27	7·38
882	32	4·21	8	" 7	5 7	2900	12	28	1·55	3·58	7·74
871	31	4·36	8	" 7	5 24	3000	12	29	1·74	3·94	8·09
861	30	4·51	8	" 6	5 41	3100	13	29	1·92	4·33	8·45
858	30	4·65	9	" 6	5 59	3200	13	29	2·11	4·80	8·84
840	29	4·86	9	" 6	6 18	3300	14	30	2·20	5·30	9·21
830	29	4·94	9	" 6	6 36	3400	14	31	2·30	5·84	9·58
820	28	5·09	10	" 5	6 56	3500	15	33	2·37	6·45	9·97
811	28	5·23	10	" 5	7 15	3600	15	35	2·43	7·12	10·35
802	27	5·39	10	" 5	7 34	3700	16	37	2·47	7·90	10·74
793	27	5·52	11	" 5	7 54	3800	17	40	2·50	8·70	11·14
784	27	5·67	11	" 5	8 15	3900	17	43	2·51	9·60	11·54
775	26	5·81	11	" 4	8 35	4000	18	46	2·52	10·7	11·94
766	26	5·96	11	" 4	8 57	4100	—	50	2·52	11·9	12·35
758	26	6·11	12	" 4	9 18	4200	—	54	2·53	13·3	12·76
750	26	6·25	12	" 4	9 40	4300	—	58	2·54	14·9	13·18
741	26	6·40	12	" 4	10 3	4400	—	63	2·54	16·6	13·62
733	26	6·54	12	" 3	10 27	4500	—	69	2·55	18·6	14·04
725	26	6·69	13	" 3	10 50	4600	—	75	2·56	20·8	14·48
717	26	6·83	13	" 3	11 15	4700	—	82	2·57	23·8	14·92
710	26	6·98	13	" 3	11 39	4800	—	90	2·58	27·4	15·38
704	26	7·13	14	" 3	12 4	4900	—	98	2·59	32·5	15·84
693	26	7·27	14	" 3	12 28	5000	—	106	2·60	39	16·28
692	25	7·42	14	" 3	12 54	5100	—	114	2·61	46	16·75
686	25	7·56	15	" 3	13 20	5200	—	123	2·61	52	17·21
680	25	7·71	15	" 2	13 45	5300	—	132	2·62	58	17·67
674	25	7·85	15	" 2	14 10	5400	—	142	2·62	64	18·12
668	25	8·00	16	" 2	14 36	5500	—	150	2·62	71	18·68

Note.—This range table is also suitable for the 15-lb. (Mark I) shrapnel shell.

## Range Table for 15-pr. B.L. Gun, Mark I.

Based on Practice of 21 and 22.5.95.

Minutes 39.421.

Charge ...	weight, 15½ oz.	Projectile weight, 15-pr. shrapnel shell, Mark II.
	gravimetric density, 118·85.	
	0·233 nature, size, 5/11, cordite.	

Remaining velocity.	5 mins. elevation or deflection alters point of impact.			Slope of Descent.	Elevation.	Range.	Fuse Scale, for Time and Perfusion, Mark IV.	50 per cent. of rounds should fall in			Time of flight.
	Range.	Laterally or Vertically.	Deflection for drift (telescopic sight only).					Length.	Breadth.	Height.	
f.s.	yards.	yards.	mins.	—	° ′	yards.	—	yards.	yards.	yards.	secs.
1527	63	0·14	..	1 in 381	0 8	100	1	..	..	..	0·23
1485	63	0·29	1	214	0 15	200	..	..	..	..	0·46
1446	63	0·43	1	149	0 22	300	1	..	..	..	0·68
1407	63	0·58	1	110	0 30	400	1	..	..	..	0·91
1368	63	0·72	2	86	0 38	500	1	14	0·11	0·16	1·13
1330	63	0·87	2	72	0 46	600	2	14	0·11	0·25	1·37
1296	62	1·01	2	61	0 54	700	2	15	0·11	0·33	1·60
1262	61	1·16	2	54	1 2	800	2	15	0·11	0·41	1·84
1230	60	1·31	2	46	1 10	900	3	16	0·11	0·49	2·07
1200	59	1·45	3	40	1 18	1000	3	17	0·12	0·58	2·31
1170	58	1·60	3	35	1 27	1100	4	17	0·12	0·66	2·55
1143	58	1·74	3	31	1 36	1200	4	18	0·12	0·74	2·79
1116	51	1·89	3	27	1 45	1300	4	19	0·12	0·83	3·04
1092	49	2·03	3	23	1 54	1400	5	19	0·12	0·93	3·28
1070	47	2·18	3	20	2 4	1500	5	20	0·13	1·03	3·54
1052	45	2·32	4	18	2 14	1600	6	21	0·15	1·14	3·80
1034	43	2·47	4	17	2 25	1700	6	21	0·18	1·26	4·06
1020	41	2·61	4	16	2 35	1800	6	22	0·22	1·39	4·33
1005	39	2·76	4	14	2 46	1900	7	22	0·27	1·53	4·60
.991	38	2·91	4	13	2 58	2000	7	23	0·33	1·68	4·87
.977	37	3·05	5	11	3 10	2100	8	23	0·30	1·82	5·16
.964	37	3·20	5	11	3 22	2200	8	24	0·47	1·97	5·45
.952	36	3·34	5	10	3 35	2300	9	25	0·58	2·14	5·75
.940	35	3·49	6	10	3 50	2400	9	25	0·70	2·34	6·05
.928	35	3·63	6	9	4 4	2500	10	26	0·85	2·52	6·37
.916	34	3·78	6	9	4 19	2600	10	26	1·02	2·76	6·71
.904	33	3·92	7	8	4 34	2700	11	27	1·18	3·00	7·04
.893	32	4·07	7	8	4 50	2800	11	27	1·36	3·27	7·38
.882	32	4·21	8	7	5 7	2900	12	28	1·55	3·60	7·74
.871	31	4·36	8	7	5 24	3000	12	28	1·74	3·94	8·08
.861	30	4·51	8	6	5 41	3100	13	29	1·92	4·33	8·45
.850	30	4·65	9	6	5 59	3200	13	29	2·11	4·80	8·84
.840	29	4·80	9	6	6 18	3300	14	30	2·30	5·30	9·21
.830	29	4·94	9	6	6 36	3400	14	31	2·30	5·84	9·58
.820	28	5·09	10	5	6 56	3500	15	33	2·37	6·45	9·97
.811	28	5·23	10	5	7 15	3600	15	35	2·43	7·12	10·35
.802	27	5·38	10	5	7 34	3700	16	37	2·47	7·90	10·74
.793	27	5·52	11	5	7 54	3800	17	40	2·50	8·70	11·14
.784	27	5·67	11	5	8 15	3900	17	43	2·51	9·00	11·54
.775	26	5·81	11	4	8 35	4000	18	46	2·52	10·7	11·94
.766	26	5·96	11	4	8 57	4100	—	50	2·52	11·9	12·35
.758	26	6·11	12	4	9 18	4200	—	54	2·53	13·3	12·76
.750	26	6·25	12	4	9 40	4300	—	58	2·54	14·9	13·18
.741	26	6·40	12	4	10 3	4400	—	63	2·54	16·6	13·62
.733	26	6·54	12	3	10 27	4500	—	69	2·55	18·6	14·04
.725	26	6·69	13	3	10 50	4600	—	75	2·56	20·8	14·48
.717	26	6·83	13	3	11 15	4700	—	82	2·57	23·8	14·92
.710	26	6·98	13	3	11 39	4800	—	90	2·58	27·4	15·38
.704	26	7·13	14	3	12 4	4900	—	98	2·59	32·5	15·84
.698	26	7·27	14	3	12 28	5000	—	106	2·60	39	16·28
.692	25	7·42	14	3	12 54	5100	—	114	2·61	46	16·76
.686	25	7·56	15	3	13 20	5200	—	123	2·61	52	17·21
.680	25	7·71	15	2	13 45	5300	—	132	2·62	58	17·67
.674	25	7·85	15	2	14 10	5400	—	142	2·62	64	18·12
.668	25	8·00	16	2	14 36	5500	—	150	2·62	71	18·58

Note.—This range table is also suitable for the 15-lb. (Mark I) shrapnel shell.

## SECTION GUN DRILL.

*Battery gun drill*, which does not vary with the equipment, is given in "Field Artillery Drill."

The following paragraphs give the duties of the detachments at the section commander's orders.

Single detachments should be accustomed to drill as if forming part of a section, and the instructor should therefore always use the orders given for the section commander.

*On dismounted parades* the detachment will form Detachment Rear, where it is laid down for them to mount, and Nos. 6, 7, 8, and 9 will attend to the limbers, Nos. 6 and 7 pushing in rear, 8 and at the pole.

---

## ARRANGEMENT.

### THE DETACHMENT—

- To tell off.
- Detachment rear.
- To form detachment rear in action.
- Take post from detachment rear in action.
- Mounted.
- To mount.
- To dismount.
- To move the gun with drag ropes.
- " " without "

### GENERAL DUTIES—

- Wagon supply.
- Casualties.
- Details of duties.
- Signals.

### PREPARATION FOR ACTION.

#### ACTION.

#### TO FIRE—

- Miss-fire.

#### TO LOAD.

#### MAGAZINE FIRE.

#### CASE.

#### TO STAND FAST.

#### TO CEASE FIRING.

#### TO LIMBER UP.

#### INDIRECT LAYING—

- One aiming post.
- Two " posts.

**MOUNTING AND DISMOUNTING—**

To dismount the gun and carriage.

To mount        "        "

**DISABLED ORDNANCE—**

To replace a damaged wheel.

To remove a gun and carriage by a limber.

To        "        "        wagon.

**METHOD OF DRILLING RECRUITS—**

General remarks.

To fire.

To load.

**THE DETACHMENT.**

On mounted parades, as long as limbered up, No. 1 remains mounted on the left of the leaders—he does not dismount when the detachment is ordered to do so.

The detachment consists of nine numbers, who fall in two deep, one pace between ranks, No. 1 on the right of the front rank.

**TO TELL OFF.**

<i>Section Commander.</i>		<i>No. 1.</i>
—		—
.... Section—Tell Off.		

*At the order from the section commander*—No. 1 numbers 1; the right hand man of the rear rank numbers 2; the right hand man of the front rank 3; the second man from the right of the rear rank 4; his front rank man 5; and so on.

**DETACHMENT REAR.**

Formed as above, 3 yards in rear of the gun wheels, No. 1 covering the off wheel.

**TO FORM DETACHMENT REAR IN ACTION.**

<i>Section Commander.</i>		<i>No. 1.</i>
—		—
.... Section—Detachment Rear.		No. .... Double March.

*At the order from the section commander*—No. 1 doubles to his place and gives the order “Double March.”

*At the order from the No. 1*—The numbers double into their places on the left of No. 1, each halting as he reaches his place.

**TO TAKE POST FROM DETACHMENT REAR IN ACTION.**

<i>Section Commander.</i>		<i>No. 1.</i>
—		—
.... Section—Take Post.		No. .... Double March.

*At the order from the No. 1*—All the numbers double to their places.

## MOUNTED.

No. 1 on his horse; 2 and 3 on the gun limber; 4 and 5 on the axletree seats; 6 and 7 on the wagon limber; 8 and 9 on the wagon body; 2, 4, 6, and 8 on the near; 3, 5, 7, and 9 on the off side.

The actual positions of the numbers on the carriages are as follows:—

*At the order "Attention"*—they sit upright, holding the handstraps with both hands.

*At the order "March"*—they take hold of the guard irons with their outward hands, and when going over rough ground slightly raise themselves so as to avoid being jolted.

*At the order "Sit at Ease"*—they drop the handstraps and sit well back, both hands between the thighs.

When a subdivision is without a wagon, No. 6 may *on an emergency on service* ride between Nos. 2 and 3 when going into action. In this case he will mount and dismount by the front of the limber on the near side.

## To MOUNT.

<i>Section Commander.</i>	<i>No. 1.</i>
.... Section—Detachments, Prepare to Mount—Mount.	

*At the order "Detachments Prepare to Mount"* from the section commander—the numbers double to their places at the carriages; 2 and 6 lay hold of the guard irons with their left, 3 and 7 with their right hands, placing the inner foot on the trail or perch handle; 4 and 8 lay hold of the guard irons with their right hands, placing the right foot on the foot-rest or spoke; 5 and 9 lay hold of the guard iron with the left hand, placing the left foot on the foot-rest or spoke.

*At the order "Mount"*—the whole spring into their places. The numbers on the limbers turn round to the front, lifting their feet close together and throwing them over the guard irons; the numbers on the axletree seats turn outwards.

## To DISMOUNT.

<i>Section Commander.</i>	<i>No. 1.</i>
.... Section—Detachments, Prepare to Dismount—Dis- mount.	

*At the order "Detachments Prepare to Dismount"* from the section commander—Nos. 2, 3, 6, and 7 turn to the rear, throwing their legs over the guard irons; Nos. 4 and 5 place their inward hands on the gun and their feet in front of the foot-rests; the other numbers stand up, keeping their outward hands on the guard irons.

*At the order "Dismount"*—the whole jump off and form detachment rear.

## TO MOVE THE GUN WITH DRAG ROPES.

<i>Section Commander.</i>	<i>No. 1.</i>
.... Section—with drag ropes, Prepare to Advance.	

*At the order from the section commander—Nos. 2 and 3 hook the drag ropes to the gun wheel washers, the two highest numbers go to the pole, and the remainder man the ropes.*

## TO MOVE THE GUN WITHOUT DRAG ROPES.

<i>Section Commander.</i>	<i>No. 1.</i>
.... Section—without drag ropes, Prepare to Advance.	

*At the order from the section commander—Nos. 2 and 3 push between the muzzle and wheels; Nos. 4 and 5 man the gun wheels; the two highest numbers go to the pole, and the remainder assist.*

## GENERAL DUTIES.

No. 1 commands, attends to the handspike, sees that the time fuzes have been set correctly, rams home, and lays for direction.

No. 2 attends to the brake, shell pocket, and vent, fires, and mans the wheel.

No. 3 attends to the brake, shell pocket, and breech, supplies himself with ammunition, sets time fuzes during ranging, shows them to No. 1, takes out the safety pin or pins, loads, and mans the wheel.

No. 4 lays for elevation and lifts at the handspike in running up or back.

No. 5 fills the portable magazines, loosening the nuts of time fuzes during ranging, and setting them after that is completed.

No. 6 supplies No. 3 with ammunition in the portable magazines, fills up the shell pockets and assists No. 5.

*Except when it is otherwise ordered, the numbers work on their own sides of the gun, even numbers on the right side, odd numbers on the left.*

## WAGON SUPPLY.

One wagon for each section is brought up as detailed in Field Artillery Drill.

As soon as the wagon halts the Nos. 5 of the two guns of the section go to the wagon body and issue ammunition to their respective guns as above detailed.

The numbers brought up on the wagon first unhook the wheel horses, and then perform the duties detailed for No. 6 to the two guns of the section—the numbers on the off side of the wagon to the right gun, those on the near side to the left gun.

*At standing gun drill, without wagons, Nos. 7, 8, and 9 stand 5 yards in rear of the limber.*

## CASUALTIES.

The captain is responsible for the replacement of casualties as directed in Field Artillery Drill. Section commanders order such changes of duties in their detachments as they consider necessary.

If the full detachments cannot be maintained the duties are divided as follows:—

*With Five Numbers*—No. 2 supplies No. 3 with ammunition in addition to his other duties.

*With Four Numbers*—No. 2 performs the duties of Nos. 5 and 6. No. 4 performs the duties of Nos. 2 and 4.

## DETAILS OF DUTIES.

## No. 1.

No. 1 is responsible for the entire service of his gun.

While in action he will pay particular attention to the following points:—

That the gun is in the general alignment of the battery.

That the shell pockets are filled up, and that their lids are kept closed and fastened.

Should it be necessary for No. 1 to leave the handspike, No. 2 will perform his duties at the handspike in addition to his own duties.

Should a case arise in which it is desirable that No. 1 should lay, he will perform the duties of No. 4, with the addition of "commands, and sees that the time fuzes have been set correctly," No. 4 performing No. 1's duties with the above exceptions.

No. 1 lays for direction by looking along the line given by the elevating screw, cam lever, and muzzle while standing at the end of the handspike, not by looking over the sights. When, however, great accuracy of line is of importance the laying for direction will be done by No. 4, in which case No. 1 will traverse according to No. 4's signals.

No. 1 only gives the words of command shown for him; he does not repeat the section commander's orders. His executive orders should be no louder than is necessary for his subdivision to hear.

## No. 2.

No. 2 must stand clear of the layer when Scott's sights are used.

## No. 3.

No. 3 opens and closes the breech, as follows:—

*To open the breech*—He takes hold of the cam lever with his left hand, raises it to its full extent, draws it towards him as far as it will go, folds it down, and then with his right hand throws the breech open by the loop.

*To close the breech*—He takes hold of the cam lever with his left hand, raises it to its full extent, and swings the breech screw round until the carrier ring is flush against the breech of the gun. Still keeping the lever raised with his left hand he then pushes the screw home with his right hand on the loop, and then forces the lever from him as far as it will go, and folds it down.

No. 3 supplies himself with ammunition from the portable magazine, or if one has not been brought up, from the shell pocket; he places the cartridge under his left arm until he has loaded the shell.

*No. 4.*

No. 4 must keep the gun layed for elevation, whether loaded or not; he must remember to look over the sights after the loading is completed, to see that the gun has not been shifted. He must always depress last.

As a general rule the whole of the laying for direction will be done by No. 1, but when great accuracy of line is of importance No. 4 will lay for direction also, using the signals given below.

*No. 6.*

No. 6 must take the first opportunity, after coming into action, of filling up the shell pockets if any rounds have been taken from them; he must do this without interrupting the service of the gun.

As a general rule only one portable magazine should be at the gun at a time, so that if change of fuze, &c., is ordered it may be immediately carried out by Nos. 5 and 6.

*Note.*—On no account should a fuze without a safety pin be placed in any ammunition box.

SIGNALS.

Nature.	By whom given.	Meaning.
Hand raised .. .. .. ..	No. 4	My gun is layed.
Motions with either hand in the required direction, arm well back ..	No. 4 *	Trail right, or left.
Drops his hand .. .. .. ..	No. 4 *	Halt (traversing).
Points to the vent with his right hand	No. 1	Make ready.

\* Only when great accuracy of line being required, the laying for direction is done by No. 4.

PREPARATION FOR ACTION.

<i>Section Commander.</i>	<i>No. 1.</i>
.... Section—Prepare for Action.	No. .... Percussion Shrapnel, Load.

*At the order from the section commander*—The detachment dismount, and—

No. 1 sees that the bore is clear, gives the order to load, superintends the other numbers, and reports to the section commander.

No. 2 fills the tube pocket, places a tube in the vent, examines the brake and fills the shell pocket, removing the covers from the cartridges.\*

\* At drill the covers need not be removed from the cartridges.

No. 3 removes the breech cover\* and straps it to the guard irons, examines the breech fittings, loads (ramming home himself), sees that the fuze key is in its pocket on the tensile stay, examines the brake, and fills the shell pocket, removing the covers from the cartridges.†

No. 4 removes the cover of the Scott's sight bracket and straps it on the tensile stay, and examines the sights and elevating gear.

No. 5 sees that the fuze key is in its pocket, and examines the limber boxes.

The wagon numbers supply Nos. 2 and 3 each with two rounds of shrapnel and one round of case from the wagon body, see that the fuze keys are in their pockets, and examine the wagon boxes.

On the completion of the above the detachment mount without further order.

The numbers detailed to "examine" the various ammunition boxes see that they are properly filled, and that the fuzes of all shrapnel are set at "2," ‡ also that the lids open easily, and the locks are in good order. Any deficiencies in the limber boxes are filled up from the wagon body under the direction of the No. 1.

The lanyards of all the fuze keys should be attached to the leather loop inside the fuze key pockets.

If the order "Scott's sights" is given, No. 4 takes the case containing the Scott's sight out of the box on the limber, and slings it over his shoulder. He puts it back at "Cease Firing."

If the section commander orders "Without Loading—Prepare for Action," or "With Case—Prepare for Action," the duties are carried out with the necessary alterations.

## ACTION.

<i>Section Commander.</i>	<i>No. 1.</i>
.... Section—Action Front.	No. .... Action Front.

*At the order from the No. 1—*

The detachment dismount, and No. 3 unkeys, and with No. 2 lifts the trail; when the trail is clear of the hook No. 3 gives "Limber drive on."

Nos. 2 and 3 carry the trail round half a circle to the left, No. 2 shifting round the trail eye to avoid walking backwards, and lower it to the ground.

Nos. 4 and 5 man the wheels.

The limber moves as detailed in Field Artillery Drill.

*As soon as the trail has been lowered to the ground—*

No. 1 points out the target to No. 4, slips the handspike, and lays for direction.

No. 2 puts on the brake, depresses the gun until it is nearly horizontal, takes the lanyard out of the tube pocket and holds it, with the hook in his left hand, the extractor in his right.

No. 3 puts on the brake.

No. 4 sets his sight as ordered, and lays for elevation. As soon as the gun is layed he holds up his hand.

\* In very sandy soil the battery commander may order the breech covers to be left on.

† At drill the covers need not be removed from the cartridges.

‡ Only when shell are carried fuzed, *see p. 27.*

No. 5 fills the portable magazines with shrapnel, loosening the nuts of the fuzes.

No. 6 assists No. 5, and takes a portable magazine up to the gun as soon as it is ready, placing it near No. 3, but clear of the recoil.

*The positions of the numbers are as follows:—*

No. 1 one yard in rear of the trail eye.

Nos. 2 and 3 close to and facing the breech.

No. 4 on the right of the trail eye.

No. 5 in rear of the limber on the off side.

No. 6 in rear of the limber on the near side.

*Action right, left, or rear is the same except that at—*

*Action Right.*—The trail is carried round a quarter of a circle only.

*Action Left.*—The trail is carried round a quarter of a circle to the right, No. 3, in this case, shifting round the trail eye.

*Action Rear.*—The trail is not carried round.

The limber in all cases moves as detailed in Field Artillery Drill.

## TO FIRE.

No gun is ever to be fired without an *order* from the No. 1, and the No. 1 must never give this order until he has received the order from the section commander, and seen that the gun is in proper condition.

*Section Commander.*

*No. 1.*

Fire No. .... Gun.

Points to the vent.

No. .... Fire.

*At the order from the section commander*—No. 1 steps clear of the recoil to the left and points to the vent with his right hand.

*At the signal from the No. 1*—

No. 2 hooks the lanyard to the tube, steps outside the wheel, and stands facing to the front, holding the lanyard tight with his right hand, the forearm across the body, and the elbow so bent that the hand is level with the vent.

Nos. 3 and 4\* step clear of the recoil.

As soon as he sees No. 2 ready and the other numbers clear No. 1 gives the order, "No. .... Fire."

*At the order from the No. 1*—No. 2 slews his body to the right, and thus fires the gun; he then places the lanyard round his neck, the hook end hanging down on his left side, the extractor on his right.

*Directly the gun stops in its recoil it is run up to its previous position without any order.*

No. 1 assists if he considers it necessary.

Nos. 2 and 3 man the wheels.

No. 4 lifts at the handspike.

\* When using Scott's sight, No. 4 must remove the sight before stepping clear. Until new pattern sights are issued he must also do this with the tangent sight.

*As soon as the gun is run up—*  
 No. 1 lays for direction.  
 No. 2 takes out the tube and puts in a new one.  
 No. 3 opens the breech and supplies himself with a fresh round  
 of ammunition.  
 No. 4 lays for elevation.  
*In addition when using drill ammunition without further order—*  
 No. 1 forces the drill shell through the bore with the handspike  
 as soon as No. 3 has removed the drill cartridge.  
 No. 3 removes the drill cartridge as soon as he has opened the  
 breech, and hands it to No. 6.  
 No. 6 doubles up, picks up the drill shell, receives the drill  
 cartridge from No. 3, and returns them to the limber or wagon.

#### MISS-FIRE.

If there is a miss-fire No. 2 goes round to the front of the axletree, and from there takes out the old tube and puts in a fresh one, hooks the lanyard to the tube, and then resumes his position.

#### TO LOAD.

<i>Section Commander.</i>	<i>No. 1.</i>
.... Section—Shrapnel Fuze	..... Shrapnel Fuze....
.... Load.*	Load.*

*At the order from the No. 1—*  
 No. 2 takes the lanyard from round his neck and holds it with the hook in his left hand, the extractor in his right.  
 No. 3 sets the time fuze (when ranging), shows it to No. 1, takes out the safety pin or pins, and places the shell in the bore.

*As soon as he sees that No. 3 is ready to load—*  
 No. 1 takes the handspike in the centre with his left hand back up, withdraws it from the socket, canters it over unshod end next the gun, meeting it with the right hand back up, takes a pace to the front with his left foot, and, placing the unshod end against the shell, rams it gently home: then *keeping the handspike against the shell*, he applies his whole force to ensure its being true home. He then steps back and replaces the handspike in the socket.

*As soon as the shell has been rammed home—*  
 No. 3 places the cartridge in the chamber and closes the breech.

#### MAGAZINE FIRE.

<i>Section Commander.</i>	<i>No. 1.</i>
.... Section—Magazine Fire.	

*At the order from the section commander—*  
 No. 4 lays for elevation by placing two fingers over the tangent sight,† which is run down in its socket.  
 The guns are reloaded with shrapnel fuze 2, as soon as fired without any further order.

\* Or "Percussion shrapnel load."

† As in most cases the left tangent sight will be already run down in its socket, time will be saved by using it.

Nos. 5 and 6 supply No. 3 with single rounds of shrapnel fuze 2 from the limber or wagon.

The gun is not run up between rounds unless necessary.

No. 3 should not show the time fuzes to No. 1.

### CASE.

<i>Section Commander.</i>	<i>No. 1.</i>
—	—
.... Section—Case.	

This is exactly the same as above, substituting case for shrapnel fuze 2.

### TO STAND FAST.

<i>Section Commander.</i>	<i>No. 1.</i>
—	—
.... Section—Stand Fast.	

*At the order from the section commanders—*

All stand fast, whatever they are doing, except that No. 2 unhooks the lanyard if it is hooked to the tube, and that if a safety pin has been taken out No. 3 places the shell in the bore.

At the order "Go on" the work is continued.

### TO CEASE FIRING.

<i>Section Commander.</i>	<i>No. 1.</i>
—	—
.... Section—Cease Firing.	No. .... Percussion Shrapnel Load.

*At the order from the No. 1—*

The guns are loaded, and each number, *as soon as he has performed his share of the loading*, proceeds as follows:—

No. 1 straps the handspike on the trail.

No. 2 takes off the brake, puts the lanyard in the tube pocket, elevates the gun into the travelling position, and sees that the shell pocket is properly shut.

No. 3 takes off the brake, and sees that the shell pocket is properly shut.

No. 4 places the Scott's sight (if it is in use) in its case, and returns the case to the box on the limber.

Nos. 5 and 6 replace in the limber or wagon the ammunition in the portable magazines, and then book them in their places.

If the section commander orders "Without Loading—Cease Firing," or "With Case—Cease Firing," the duties are carried out with the necessary alterations.

*Note.—If for any reason it is impossible to fire the guns at "Cease Firing," the battery commander may order the cartridges to be withdrawn and the shell left in the bore.*

## TO LIMBER UP.

<i>Section Commander.</i>	<i>No. 1.</i>
.... Section—Front Limber Up.	
<i>At the order from the section commander—</i>	
Nos. 2 and 3 carry the trail round half a circle to the right, No. 2 shifting round the trail eye to avoid walking backwards, and lower it to the ground.	
Nos. 4 and 5 man the wheels.	
<i>As soon as the trail is lowered the numbers get under cover—</i>	
No. 1 in front of No. 2;	
Nos. 2 and 3 between breech and wheels;	
Nos. 4 and 5 " muzzle " ;	
No. 6 in front of No. 4;	
the whole with their backs to the axletree.	
The limber comes up as detailed in Field Artillery Drill, and No. 1 gives "Halt, Limber Up."	
<i>At the order from the No. 1—</i>	
Nos. 2 and 3 lift the trail and place it on the hook.	
No. 3 keys up.	
Nos. 4 and 5 man the wheels.	
On the completion of the above, the detachment mount without further order.	
<i>Right, left, or rear limber up is the same except that at :—</i>	
<i>Right Limber Up</i> —The trail is carried round a quarter of a circle only.	
<i>Left Limber Up</i> —The trail is carried round a quarter of a circle to the left, No. 3 in this case shifting round the trail eye.	
<i>Rear Limber Up</i> —The trail is not carried round.	
The limber in all cases moves as detailed in Field Artillery Drill.	

## INDIRECT LAYING.

Aiming posts should be issued in pairs of the same colour, the right guns of sections having red; the left, blue. They should be planted with their coloured sides towards the guns, except when, owing to light, &c., the section commanders order the white sides.

<i>Section Commander.</i>	<i>No. 1.</i>
.... Section—One Aiming Post.	
<i>At the order from the section commander—</i>	
No. 1, standing at the end of the handspike, directs No. 4, by signal, to plant his aiming post in line with the target.	
Nos. 2 and 3 mark on the ground the position of the wheels.	
No. 4 doubles out about 50 yards to the front with one aiming post, which he plants as directed by No. 1; he then doubles back and gets out his clinometer.	
At "Go on" the firing is continued, the gun being layed for direction on the aiming post, and for elevation by clinometer.	

When the target cannot be seen by the No. 1 dismounted, the section commander will direct whether he should mount or stand up on the limber.

TWO AIMING POSTS.

Aiming posts should be issued in pairs of the same colour, the right guns of sections having red, the left blue. They should be planted with their coloured side towards the gun, except when, owing to light, &c., the section commander orders the white side.

<i>Section Commander.</i>	<i>No. 1.</i>
—	—

.... Section—Two Aiming Posts.

*At this order from the section commander, which is given when the battery is halted under cover previous to occupying a position by the deliberate method—*

No. 4 gets out his clinometer and aiming posts.

As soon then as the battery commander gives the signal (see Field Artillery Drill), the section commanders and layers fall out in the usual way, but each layer carries his two aiming posts and clinometer instead of sights.

The battery commander, after pointing out the target, shows the position of the front post of the directing gun, the layers of the remaining guns extend along the alignment and plant their front posts at the interval ordered.

Each layer, as soon as he has planted his front post, doubles a short distance to the rear and plants his second post in line with the target and the front one. He then takes up a position for his gun out of sight of the target and in line with his two posts, looking to the directing gun for his dressing.

The section commanders see that the layers are properly placed before they double back to the battery.

The Nos. 1 bring their guns into action in line with the two posts, and Nos. 2 and 3 mark on the ground the position of the wheels.

After the first round the gun is layed for direction on the near aiming post only.

MOUNTING AND DISMOUNTING.

This should only be practised at the annual course of military training, and then only sufficiently for instruction: every care must be taken that the equipment is not injured.

To DISMOUNT THE GUN AND CARRIAGE.

<i>Section Commander.</i>	<i>No. 1.</i>
—	—

<i>Dismount No. .... Gun and Carriage.</i>	<i>No. .... Prepare to Dismount the Gun.</i> <i>Dismount the Gun.</i> <i>Dismount the Carriage.</i> <i>Lift—Lower.</i>
--	---

*At the order "Prepare to Dismount the Gun"—*

*With Mark I Carriage.—No. 1 removes the sights, disconnects*

the elevating gear, runs it up, and throws it back. He then mans his handspike.

Nos. 2 and 3 unkey the capsquares, remove the inner stanchions of the guard irons, drag shoe, &c., and man the wheels.

*With Mark II Carriage.*—No. 1 removes the sights, disconnects the breech, taking care that the gun and cradle do not slide to the rear, and mans his handspike.

Nos. 2 and 3 take off the capsquares, remove the drag shoe, the inner stanchion of the guard iron on the right side, and the axletree seat on the left, and man the wheels.

*With Marks I and II Carriages.*—Nos. 4 and 5 double two drag ropes and make fast the bights with a reef knot, half over and half under the breech, just in rear of the sight sockets; the running ends are then passed outside the tire of the wheels on the same level as the breech, two turns taken round the felloe, one on each side of a spoke to prevent slipping, and made fast with a half hitch black-walling against the tire; Nos. 4 and 5 then man the wheels.

Nos. 6 and 7 bring up the drag ropes to Nos. 4 and 5, and man the wheels.

Nos. 8 and 9 bring up the spare handspike, place it in the bore and man it.

*At the order "Dismount the Gun"—*

Nos. 8 and 9 lift the gun clear of the trunnion holes and keep it horizontal,\* while Nos. 2, 4, and 6, 3, 5, and 7, man the wheels forward until the gun is lowered to the ground, No. 1 raises the trail off the ground until the trunnions are clear.

*At the order "Dismount the Carriage"—*

Nos. 2, 3, 4, and 5 go to the carriage; Nos. 2 and 3 in rear, 4 and 5 in front.

Nos. 6, 7, 8, and 9 go to the wheels; Nos. 6 and 7 in front, 8 and 9 in rear.

Nos. 8 and 9 take off the linch pins and washers.

*At the order "Lift"—*The carriage is lifted and the wheels taken off.

*At the order "Lower"—*The wheels are placed on the ground, dish down, and the carriage is lowered to the ground.

#### To MOUNT THE GUN AND CARRIAGE.

<i>Section Commander.</i>	<i>No. 1.</i>
Mount No. .... Gun and Carriage.	No. .... Mount the Carriage. Lift. Prepare to Mount the Gun. Mount the Gun.

This is exactly opposite to the dismounting just described.

*With Mark I Carriage.*—Nos. 2 and 3 do not raise the capsquares until the trunnions are about 6 inches from them. This is to allow the jacket to drop in rear without jamming.

*Note.*—Limbers and wagons are mounted and dismounted in a similar way, the poles having been previously removed.

---

\* With Mark I carriage Nos. 2 and 3 raise the capsquares, and as soon as the gun is clear of the trunnion holes lower them to prevent jamming.

## DISABLED ORDNANCE.

Whenever operations are not described in detail or numbers are not told off to particular duties, the No. 1 will order such duties to the several numbers as may be required.

### TO REPLACE A DAMAGED WHEEL.

Should a gun wheel be disabled in action, it should be immediately turned so as to bring the sound portion on to the shoe, and, if necessary, lashed, and notice should be sent to the captain.

The latter will immediately send up another wheel, which will be brought alongside the damaged one, and the wheels changed as follows:—

<i>Section Commander.</i>	<i>No. 1.</i>
No. .... Change Wheels.	No. .... Change Wheels.
	Lift.
	Lower.

*At the order "No. .... Change Wheels," from the No. 1:—*

Nos. 1 and 6 go to the damaged wheel, No. 1 in rear, No. 6 removes the linch pin and washer.

Nos. 2, 3, 4, and 5 man the traversing handspike, which is placed under the axletree by No. 2 or 3 (according to side).

*At the order "Lift":—*

The axletree is lifted and the damaged wheel is taken off; No. 6 rolls it out of the way, and the new wheel is put on by the numbers who brought it up.

*At the order "Lower":—*

The carriage is lowered, the linch pin and washer put on by No. 6, the handspike replaced by No. 2 or 3, and all resume their duties in action.

The damaged wheel is either left on the ground or removed by the numbers who brought up the new one, as the captain may have directed.

### TO REMOVE A GUN AND CARRIAGE BY A LIMBER.

The gun is dismounted, the horses taken out; the limber is run over the gun so that the breech is towards the pole, and the trunnions under the limber hook; the muzzle and the pole are raised, and the gun slung with a drag rope round the trunnions to the limber hook; the end is passed to the front and the muzzle borne down, a half hitch taken round the breech and made fast to the futchells.

The carriage is dismounted, the sliding bracket and guard irons removed, and the elevating gear run up and thrown back. It is then lifted, trail first, up the front of the limber on to the top of the box, until the weight is balanced for draught.

The trail is secured by a drag chain to a handspike in the bore, the wheels are placed dish down on the top of the carriage, securely lashed with drag ropes to the futchells and limber hook in rear, and to the footboard in front. The sliding bracket and guard irons are secured in front of the limber.

To REMOVE A GUN AND CARRIAGE BY A WAGON.

The gun is slung to a limber as before. The carriage is lifted by all the numbers on to the wagon body until the trail eye nearly touches the limber box, and is secured to the perch by the drag chain. The wheels are placed dish down on the top of the carriage, and lashed.

---

METHOD OF DRILLING RECRUITS.

GENERAL REMARKS.

Many good recruits are acquainted only with the commonest English words, and as their duties and the material they have to use are altogether new and strange, instructors should be careful—

To use the simplest language possible.

To explain, as they occur, all technical terms.

To illustrate descriptions by means of a piece of chalk, or otherwise, and in all cases to render clear the object of the various duties.

Not to attempt to teach recruits elaborate descriptions, exact measurements, &c., which they do not understand.

To avoid needless repetitions, or wearying the men by keeping them for a long time at one thing; the drill should be varied by short descriptions (avoiding manufacturing details), setting fuzes, &c.

To bring men forward by successive steps, by explaining a position and then doing it; for instance, when commencing recruits' gun drill, the instructor should himself show how a duty should be performed, and then cause every man in turn to do that duty (make every man do No. 1's duty, then every man No. 2's, then No. 4's, and so on). When each man knows the duties of each post separately, the numbers who work and move together should be instructed after the manner described below, before commencing gun drill in quick time.

Great patience is necessary on the part of the instructor. He must make allowance for the different capacities of the recruits, and squads should periodically be arranged so that the intelligent soldier may reap the advantage of his work, and not be kept back by those of inferior ability. Recruits as they progress should be called out in turn to drill, for this gives a man confidence, helps him to learn, and causes him to take an additional interest in his work.

The instructor should place himself where he can be seen and heard by all in the squad; should stand in a smart soldier like attitude, and should avoid pacing up and down, looking down on the ground, turning his back on the squad, and similar habits, which have the effect of fidgeting the men, and distracting their attention.

His explanation should be given in a distinct voice; his word of command should be sharp and decisive.

Stress is laid on the above points, because men unconsciously imitate their instructors. A first-rate instructor will make a good detachment; his manner and style are therefore of the first importance.

The utmost alertness of attitude and smartness of movement should be enforced throughout gun drill.

The instructor can at any time ascertain that each number is at his post, by proving. This he does by calling out "*Prove your numbers—No. 1, No. 2, &c.*" The man called upon raises his right hand, and extends it smartly to the front, hand open, thumb uppermost, hand as high as the shoulder. When the next number is called, he drops his hand. The last number lowers his hand at the word "*Down.*"

If at any time the instructor wishes to change the numbers, he gives the order, "*Change Rounds.*" On this, No. 1 becomes 9; 9, 8; 8, 7; 7, 6; 6, 5; 5, 4; 4, 3; 3, 2; 2, 1.

The following is only an example of how the drill should be taught; the details of the other operations should be divided up in a similar manner.

#### To FIRE.

At the order "*Fire No. .... Gun*" from the section commander—

No. 1 steps clear of the recoil to the left, and points to the vent with his right hand.

*At that signal—*

No. 2 hooks the lanyard to the tube, steps outside the wheel, &c.

Nos. 3 and 4 step clear of the recoil.

*No. 1.—Fire No. .... Gun.*"

As soon as No. 1 sees No. 2 ready, and the other numbers clear, he gives "*No. .... Fire.*"

*At that order—*

No. 2 slew his body to the right, and thus fires the gun; he then places the lanyard round his neck.

*"Go on."*

Next explain that directly the gun has ceased recoiling, it is run up to its previous position without any further orders.

No. 1 assists if he considers it necessary.

Nos. 2 and 3 man the wheels.

No. 4 lifts at the handspike.

*Nos. 1, 2, 3, and 4—"Go on."*"

*Next explain—*

As soon as the gun is run up.

No. 1 lays for direction.

No. 2 takes out the tube and puts in a new one.

No. 3 opens the breech and supplies himself with a fresh round of ammunition.

No. 4 lays for elevation.

*Nos. 1, 2, 3, and 4—"Go on."*"

*Next give—*

In addition when using drill ammunition, without further order, the gun must be unloaded.

No. 3 removes the drill cartridge.

No. 1 forces the drill shell through the bore, &c.

No. 6 doubles up, picks up the drill shell, receives the drill cartridge from No. 3 and returns them to the limber or wagon.

*Nos. 1, 3, and 6—"Go on."*"

## To LOAD.

On the command—“Shrapnel Fuze—Load” from the section commander—

No. 1 gives the order to his detachment.

“No. .... Shrapnel Fuze—Load.”

No. 2 takes the lanyard from round his neck and holds it with the hook in his left hand, the extractor in his right.

No. 2—“Load.”

No. 3 sets the time fuze (during ranging only—after that is completed it is set by No. 5), shows it to No. 1, takes out, &c., &c.

No. 3—“Load.”

Next give—

As soon as No. 1 sees that No. 3 is ready to load he unships the handspike, &c.

No. 1—“Go on.”

Next give—

No. 3 as soon as the shell has been, &c., &c.

No. 3—“Go on.”

## LIST OF STORES.

Carriage, B.L., 15-pr.

Articles.	Mark I.	Mark II.	Where carried.
Blankets, G.S. .. .. ..	2	2	On axletree seats.
Brushes, spoke .. .. ..	1	..	In trail box.
Buckets, water, G.S., leather .. .. ..	..	1	In pocket, on left tensile stay.
Buckets, water, G.S., leather .. .. ..	2	2	On breast chain rings.
Cans, lubricating, No. 9 .. .. ..	1	..	In trail box.
” sponge, No. 6 ” .. .. ..	..	1	Between side brackets.
Caps, sponge, No. 6 .. .. ..	2	2	On cleaners.
Case, can, lubricating, No. 9, B .. .. ..	..	1	Between side brackets.
Cleaners, piassaba .. .. ..	1	1	On left tensile stay.
wool .. .. ..	1	1	On right
Covers, bracket, sight, telescopic.. .. ..	1	1	On sight bracket.
breech .. .. ..	1	1	On gun.
Drifts, vent.. .. ..	1	1	On transom.
Hammers, claw, 20-oz. .. .. ..	1	..	In trail box.
Handspike, traversing, No. 1 .. .. ..	1	..	Left side bracket.
” .. .. ..	..	1	Right ”
Keys, fuze, universal .. .. ..	1	1	In pocket, on left tensile stay.
Oil, Rangoon .. .. pints ..	..	..	In oil can.
Pockets, brush, spoke .. .. ..	..	4	In pocket, on left tensile stay.
key, fuze, universal .. .. ..	1	1	On left tensile stay.
tube .. .. ..	1	1	On left side bracket.
*Posts, aiming, special .. .. ..	2	2	Left side bracket.
Pincers, carpenters’, pairs .. .. ..	1	..	In trail box.
” .. .. ..	..	1	Right side bracket.
Plugs, vent, T .. .. ..	1	1	Attached to breech cover.
Rimers, vent, T .. .. ..	1	1	On transom.
Shoes, drag, No. 7.. .. ..	1	1	On hook, front of carriage.
Spanners, hydraulic buffer, No. 59 .. ..	..	1	Right side bracket.
McMahon, 15” .. .. ..	1	..	In trail box.
” .. .. ..	..	1	Left side bracket.
Tampon .. .. ..	1	1	In gun.

\* 2 red disc in Nos. 1, 3, and 5 subdivisions.

2 blue ” Nos. 2, 4, and 6 ”

**Limber, B.L., 15-pr.**  
 (Carriage and ammunition wagon.)

Articles.	Mark I.	Mark II.	Where carried.
Axes, felling, curved helvo ..	1	1	Under footboard.
,, pick heads, 6½ lbs. ..	1	1	
,, helves, 34½" ..	1	1	,, limber.
Buckets, water, G.S. ..	2	2	
Box, sight, telescopic ..	1	1	Platform board, "near" side.
Boxes, grease, 3 lbs. ..	1	1	Rear of axletree.
,, obturating pads ..	1	1	
,, fuze, No. 18 ..	2	2	
19 ..	2	2	In limber box.
Brushes, water, carriage ..	1	1	Under limber, "near" side.
Blankets, G.S. ..	2	2	On lids of limber box.
Cases, carbine ..	2	2	On carbines.
Clamps, tangent sight ..	2	2	1 in "near" and "off" holdall, gun limber.
Couples, trace ..	1	1	In "near" holdall, wagon limber.
Cartridges, B.L., 15-pr., cordite, 15½ ozs., size 5 ..	40	40	In cartouches.
Cartouches ..	2	2	In limber box.
Cans, lubricating, No. 3 ..	1	1	
Cases, can, lubricating, No. 3 ..	1	1	Rear of axletree.
Covers, cartridge ..	40	40	On cartridges.
Drivers, screw, 4" ..	1	1	"Off" holdall, limber box.
Discs, pad, obturating { adjusting ..	1	1	
protecting ..	1	1	
Fuzes, T. and P., No. 50..	40	40	In limber box.
Hooks, bill ..	1	1	Under limber, "off" side.
Kettles, camp, oval, 12 quarts ..	1	1	Front of axletree, "near" side.
Keys, fuze, universal† ..	2	2	In "near" holdall, limber box.
,, spring lock ..	2	2	In pocket, rear of limber box.
Lanyards, friction tube, T ..	2	2	In "near" holdall, limber box.
Magazines, portable ..	2	2	Rear of limber.
Oil, Rangoon ..	1	1	In oil can.
Pins, linch, 2nd Class ..	1	1	In "off" holdall, limber box.
Pads, obturating ..	1	1	In limber box.
Ropes, drag, light, pairs ..	1	1	On footboard.
Rimers, vent, T ..	1	1	In "off" holdall, limber box.
Swingletree, No. 7..	1	1	On footboard.
Sights, tangent ..	2	2	1 in "near" and "off" holdall, gun limber.
,, telescopic* ..	1	1	In "near" holdall, wagon limber.
,, fore ..	2	2	In box, on platform board.
,, ..	1	1	In "off" holdall { gun limber, wagon limber.
Springs, clip, carrier ring ..	3	3	In "off" holdall limber box.
Shells, shrapnel ..	38	38	
Shot, case ..	2	2	In limber box.
Spades, N.P. ..	2	2	1 on each side of limber box.
Tubes, friction, T ..	50	50	In limber box.
Vents, T, radial ..	1	1	In "near" holdall, limber box.
Washers, drag, 2nd Class "C" ..	1	1	Under platform board, "near" side.
,"Q" ..	1	1	Under platform board, "off" side.
Washers, vent ..	2	2	In "off" holdall, limber box.
Wrenches, ratchet A and B ..	1	1	On inside of "off" lid, limber box.

\* Carriage limber only, and 1 spare per battery, carried on ammunition wagon limber.

† When the guns are parked the fuze keys should be carried in the holdalls, on all other occasions they should be carried in the pockets.

## Wagon, Ammunition, B.L., 15-pr.

Articles.	Mark I.	Mark II.	Where carried.
Blankets, G.S. .. ..	2	2	On lids of limber box.
Boxes, grease, 14 lbs. .. ..	2	2	Rear of axletree, under wagon.
" fuze, No. 18 .. ..	4	4	In wagon box.
Bolt, stop .. ..	1*	1*	In holdall, compartment of wagon box.
Caps, sponge, No. 4 .. ..	1*	1*	On sponge.
Cases, tube, pocket .. ..	1	1	"Near" tensile stay.
Cartouches .. ..	2	2	
Cartridges, B.L., 15-pr., 15½ oz., cordite, size 5 .. ..	64	64	In wagon box.
Cases, saw, hand .. ..	1	1	On "off" side of wagon box.
Clips, head axial .. ..	3	3	In holdall, compartment of wagon box.
Covers, cartridge .. ..	64	64	On cartridges.
Cutter, wire .. ..	1	1	Under footboard.
Fuzes, T. and P., No. 56 .. ..	64	64	In wagon box.
Hambro' line .. ..	1	1	Compartment in wagon box.
Holdalls, needles, and silk twist .. ..	1	1	In "off" holdall, wagon box.
" spare parts of gun .. ..	1	1	Compartment in wagon box.
Handspikes, traversing, No. 1 .. ..	1	1	
common, 6 feet .. ..	1	1	Under wagon.
Jacks, lifting, G.S. .. ..	1	1	On platform board.
Knives, clasp .. ..	1	1	In "near" holdall, wagon box.
Keys, powder case .. ..	1	1	In "off"
Kettles, camp, oval, 12 quarts .. ..	2	2	In front of axletree. " "
Keys, fuze, universal† .. ..	2	2	In "near" holdall.
" spring, lock .. ..	2	2	In pocket, on rear of wagon box.
Lashings, tarred, 1" x 10' .. ..	2	2	On axletree.
Lavers, cam .. ..	1	1	In holdall, compartment of wagon box.
Magazines, portable .. ..	2	2	Rear of wagon.
Marline .. .. skeins	1	1	In compartment, wagon box.
Mauls, G.S. .. ..	1	1	Under wagon.
Needles, magazine, nickel silver, 4" .. ..	2	2	In "off" holdall, wagon box.
Pins, keep, bolt, hinge, lever, cam .. ..	2	2	
" " ring, carrier .. ..	2	2	In holdall, compartment of wagon box.
" " elevating .. ..	2	2	
" pin, screw, elevating .. ..	..	2	
Pockets, tube, L.S. .. ..	1	1	In case, tube pocket.
Posts, picket, 2½" .. ..	6	6	Under wagon.
Scissors, magazine .. .. pairs	1	1	In "near" holdall, wagon box.
Silk, twist .. .. ozs.	2	2	In "off"
Spanners, No. 93 .. ..	1	1	On "near" side of " "
Saws, hand, 26" .. ..	1	1	In "off" " "
Springs, stud, catch, left .. ..	6	6	
" " right .. ..	6	6	In holdall, compartment of wagon box.
" " retaining fore-sight .. ..	12	12	
Sponges, jointed, R.M.L., 13-pr. .. ..	1*	1*	Under wagon.
Shoes, drab, No. 3 .. ..	1	1	On perch.
Shell, shrapnel .. ..	62	62	In wagon box.
Shot, case .. ..	2	2	
Straps, tube box, long .. ..	1	1	Tube pocket.
Tubes, friction, T .. ..	60	60	In wagon box.
Wire, foresight .. .. yards	1‡	1‡	In holdall, compartment of wagon box.

\* 1 per battery.

† When the guns are parked the fuze keys should be carried in the holdall, on all other occasions they are to be carried in the pockets.

‡ Issued to batteries in possession of Mark I foresights, only.

MATERIALS, REPAIRING CARRIAGES, &c.

54

	For use in Peace — Twelve Months' Supply. *	For what purpose.	Where carried.
War. — Three Months' Supply.	For use in Peace — Twelve Months' Supply. *	For what purpose.	Where carried.
<i>Woolwich Store Charge, No. 4.</i>			
Staples, round, crowned, small ..	.. .. ..	6 .. 15 ..	Wagons, ammunition, and store, and artillery .. .. ..
Ties, lynch, pin .. .. ..	.. .. ..	.. .. ..	Forge limber. Store limber.
<i>Woolwich Store Charge, No. 8.</i>			
Wire, copper, 15 W.G., soft .. .. ..	.. .. ..	lbs. 1 (60 ft.) $\frac{1}{2}$ (30 ft.)	Repairs to sidearms, &c. ..
<i>Woolwich Store Charge, No. 9.</i>			
Copper, hoop ..	.. .. ..	feet 30 .. 6 $\frac{3}{4}$	General repairs to woodwork ..
Solder, tinner's ..	.. .. ..	bars .. ..	Tinwork .. .. ..
Spelter, brass ..	.. .. ..	lbs. .. ..	Brazing .. .. ..
<i>Woolwich Store Charge, No. 10.</i>			
Chains, weldless link, No. 8, W.G. ..	.. .. ..	yds. 1 $\frac{1}{3}$ ..	General repairs .. .. ..
Nails { copper, rose head, strong, No. 451 ..	.. .. ..	lbs. 3 .. 2 ..	Forge limber.
wrought tacks, No. 473 ..	.. .. ..	" .. ..	No. 3 drawer, wheeler's tool chest.

\* Carried as convenient,

+ 2 pints of this oil allowed for Station Equipment.

## MATERIALS, REPAIRING CARRIAGES, &c.—continued.

		For what Purpose.		Where carried.	
War.	—	For use in peace.	Twelve Months' Supply.	Three Months' Supply.	*
<i>Woolwich Store Charge, No. 13.</i>					
Blocks		wood, securing projectiles, limber { "near," set of 6..	sets	1	1
		projectiles, limber { "off," ..	"	1	1
		wood, securing projectiles, wagon { set of 7 ..	"	1	1
		projectiles, wagon { "near," set of 3..	"	1	1
		body { "off," ..	"	1	1
		ammunition wagon, front, B.L., 15-pr.	"	1	1
Boards,		limber, B.L., 15-pr.	"	1	1
platform		with { countersink head, bevelled { 1-in. x 4-in. ..	"	2	2
		nuts { countersink head, flat, 1-in. x 2½-in. ..	"	2	2
		with nuts, { 1-in. x 1-in. heads 1-in. thick +	"	2	2
Bolts		hexagon { 1-in. x 1-in. heads ½-in. thick +	"	1	1
		hexagon { 1-in. x 1½-in. ..	"	1	1
		head { 1-in. x ½-in. ..	"	2	2
		with nuts, { No. 35 wheel { bevel head ..	"	1	1
		nave, 2nd class, "C" { square head ..	"	1	1
		" 36 ..	"	1	1
		" 42 ..	"	2	2
Chain, iron,	1½ lbs. per yard	"	"	1	1
Forges, field		handles, lever, Mark IV	"	2	2
		screws { cheesehead ½-in. x 17/16-in. (set of 8)* ..	"	1	1
		screws { hexagon head 1-in. x ¾-in. (set of 9)† ..	"	1	1
Hooks..		wire rope and drag chain, B.L., 15-pr. §	"	2	2
		draught limber ..	"	2	2

\* Carried as convenient.  
+ Field forge Mark IV o

+ Mark II carriages only.  
S Mark I carriage only.

\* Carried as convenient.  
† Field forge Mark IV only.

## MATERIALS, REPAIRING CARRIAGES, &amp;c.—continued.

	W. — Three Months' Supply.	For use in peace. — Twelve Months' Supply. *	For what Purpose.		
			General repairs	Brackets of carriage	Where carried.
Steel, pieces	atlas, square, 1-ft. 4-in. x 1 $\frac{1}{4}$ -in. cast, round edge, 1-ft. 4-in. x $\frac{5}{8}$ -in. Siemens' flat, 1-ft. 4-in. { x 1 $\frac{1}{4}$ -in. x 1 $\frac{1}{4}$ -in. pieces round, 1-ft. 4-in. x 1 $\frac{1}{4}$ -in. plate, 1-ft. 2-in. x 4-in. { 8 $\frac{1}{2}$ -in. tire, 12-in. x 3-in. x $\frac{5}{8}$ -in., curved limber hook trail eye, or perch	1 1 1 1 1 1	General repairs	Ring tires	.. .. .. .. .. ..
Steels, morable	1 $\frac{1}{2}$ -in. x 30-in... { x 32-in. B.P., C.B. .. .. .. .. .. ..	3 3 3 3 3 3	Brackets of carriage	Drag shoe ammunition wagon	.. .. .. .. .. ..
	{ x 32-in. B.P., C.B. .. .. .. .. .. ..	1 1 1 1 1 1	Ring tires	Camp kettle lids	.. .. .. .. .. ..
	x 30-in... { x 36-in. .. .. .. .. .. ..	2 2 2 2 2 2	Brackets of carriage	Picket posts, ammunition wagon.	.. .. .. .. .. ..
	{ x 36-in. .. .. .. .. .. ..	2 2 2 2 2 2	Ring tires	For blankets	.. .. .. .. .. ..
	x 32-in. .. .. .. .. .. ..	2 2 2 2 2 2	Brackets of carriage	Maul head and drag rope..	.. .. .. .. .. ..
	x 30-in. .. .. .. .. .. ..	2 2 2 2 2 2	Ring tires	Case oil can, grease box, and picket posts on forge and store wagons	.. .. .. .. .. ..
Straps, securing	1-in. { x 22-in. .. .. .. .. .. ..	4 4 4 4 4 4	Brackets of carriage	Swords and spades	.. .. .. .. .. ..
	{ x 22-in., D.L. .. .. .. .. .. ..	4 4 4 4 4 4	Brackets of carriage	Handwheel..	.. .. .. .. .. ..
	{ x 18-in. .. .. .. .. .. ..	4 4 4 4 4 4	Brackets of carriage	Pickaxe and carbine	.. .. .. .. .. ..
	{ x 13-in. .. .. .. .. .. ..	4 4 4 4 4 4	Brackets of carriage	Felling-axe, hammer claw, pickaxe, pincers, and drag washer	.. .. .. .. .. ..
	{ x 13-in. (with safe) .. .. .. .. .. ..	4 4 4 4 4 4	Brackets of carriage	Handspike on trail	.. .. .. .. .. ..
	{ x 10-in. .. .. .. .. .. ..	4 4 4 4 4 4	Brackets of carriage	Camp kettle handles and bill-hook	.. .. .. .. .. ..
n.	{ x 22-in., B.P., C.B. .. .. .. .. .. ..	2 2 2 2 2 2	Brackets of carriage	Blankets, axletree seats	.. .. .. .. .. ..
Turnbuckles, box, under, wagon..	{ x 13-in. .. .. .. .. .. ..	2 2 2 2 2 2	Brackets of carriage	Bayonets, and Scott's sight box	.. .. .. .. .. ..
	{ x 13-in. .. .. .. .. .. ..	2 2 2 2 2 2	Brackets of carriage	Forge limber.	.. .. .. .. .. ..

Woolwich Store Charge, No. 14.			
Keys	split, round, loop.	4-in. x $\frac{1}{16}$ -in. split, round, loop.	34-in. $\frac{1}{16}$ -in. 24-in. $\frac{1}{16}$ -in. 14-in. 1-in.
Nuts, hexagon, $\frac{1}{4}$ -in.	split, round, head, $\frac{1}{4}$ -in. x 24-in.†	2-in. x 1-in. head, $\frac{1}{4}$ -in. x 24-in.†	• •
Foot rests	Foot rests	10	10
		2	2
Woolwich Store Charge, No. 19.			
Spokes	No. 35 wheels	ordinary‡	3
	slip.‡	•	2
	ordinary	•	1
	slip	•	1
	ordinary	•	1
Feloes	" 36 "	slip	1
	ordinary	•	1
	slip	•	1
	ordinary	•	1
	slip	•	1
	No. 35 wheels	back	3
	front	•	1
	" 36 "	•	1
	" 37 "	•	1
	" 38 "	back	2
	" 42 "	front	2

\* Carried as convenient.

+ Mark I carriages only.

# Mark I and II limber and ammunition wagons only:

A.

## 15-PR. B.L. CARRIAGE AND LIMBER.

## (FIELD.)

## L I M B E R .

*On footboard.*

1 pair drag ropes. 1 swingletree, No. 7.

*Under footboard and limber.*1 pickaxe. 1 felling axe.  
Fittings for swords and carbines, in front.1 bill hook.  
1 drag washer, Q.  
2 water buckets.

*On top of lid of box.*  
1 cape. 1 great coat. 1 blanket.  
1 helmet cover. 1 F.S. cap.  
1 mess tin and strap. 1 valise.  
*On side of box.—1 spade.*

3 shrapnel shells.	1 case shot.	20 cartridges in cartouche.	20 cartridges in cartouche.	1 case shot.	3 shrapnel shells.
4 shrapnel shells.				4 shrapnel shells.	
4 shrapnel shells.				4 shrapnel shells.	
4 shrapnel shells.		14 fuzes, No. 56.	5 fuzes, 1 pad and discs.	5 fuzes.	16 fuzes, No. 56.
4 shrapnel shells.		30 tubes, T.	20 tubes, T.	4 shrapnel shells.	4 shrapnel shells.

1 camp kettle. 1 oil can, No. 3, in case.  
1 portable magazine. \*1 key, fuze, universal, in pocket.

1 grease box.  
1 portable magazine.  
2 keys, lock, in pocket.  
\*1 key, fuze, universal, in pocket.

*On lid of near box.*  
†1 tangent sight.  
†1 clamp tangent sight.  
2 lanyards, T.  
1 vent, T, radial.

*On lid of off box.*  
3 springs, clip, carrier ring.  
2 washers, vent.  
†1 tangent sight.  
†1 clamp tangent sight.  
†2 foresights.  
2 trace couples.  
1 screwdriver, 4-inch.  
1 inch pin.  
1 wrench, ratchet, A, 1 do., B.  
1 Rimmer, vent T.

## C A R R I A G E .

1 cover, breech,  
with vent plug  
attached on gun.

1 fuze key, in pocket.

†1 cleaner and cap.

1 cleaner and cap.†

1 blanket on seat.

1 blanket on seat.

Fitted to carry 3 cartridges, 2 shrapnel shells, 1 case shot,	1 tube pocket.
1 cover, bracket, sight, telescopic.	Fitted to carry 1 case shot, 2 shrapnel shells, 3 cartridges,

1 drag shoe.

1 tampon, in gun.  
1 water bucket. 1 water bucket.

\* When the guns are parked, the fuze keys should be placed in the holdall in limber.  
† When not on gun.  
‡ Carried with choke end to the rear, when limbered up.

## EQUIPMENT.

A.

15-PR. B.L. WAGON AND LIMBER.  
(FIELD.)

## L I M B E R .

On footboard.

1 pair of drag ropes.	1 swingletree, No. 7.
Under footboard and limber.	
1 water brush.	
1 drag washer.	
*1 Scott's sight box.	

1 bill hook.
1 drag washer, Q.
2 water buckets.

On top of lid of box.  
1 cape, 1 great coat, 1 blanket,  
1 helmet cover, 1 F.S. cap.  
1 mess tin and strap, 1 valise.  
On side of box.—1 spade.

3 shrapnel shells.	1 case shot.	20 cartridges in cartouche.	20 cartridges in cartouche.	1 case shot.	3 shrapnel shells.
4 shrapnel shells.				4 shrapnel shells.	
4 shrapnel shells.				4 shrapnel shells.	
4 shrapnel shells.				4 shrapnel shells.	
4 shrapnel shells.				4 shrapnel shells.	
	14 fuses, No. 56.	5 fuzes. 1 pad and discs.	5 fuzes.	16 fuses, No. 56.	
		30 tubes, T.	20 tubes, T.		
1 camp kettle.		1 oil can, No. 3, in case.			
1 portable magazine.					
†1 key, fuze, universal, in pocket.					

On lid of near box.  
1 tangent sight (spare).  
1 clamp tangent sight (spare).  
2 lanyards T.  
1 vent, T, radial.

Drag shoe.	1 handspike, traversing.	1 handspike, common.	1 tube pocket, in case.	On lid of off box.
	1 handspike, common.	1 spade, jointed, and cap.		3 springs, clip carrier ring.
	1 spade, jointed, and cap.			2 washers, vent.
				1 foresight (spare).
				2 trace couples.
				1 screwdriver, 4-inch.
				1 linch pin.
				1 wrench, ratchet, A, 1 do., B.
				1 Rimer, vent T.

## WAGON

On lid of near box (body).  
1 scissors.  
1 knife, clasp.  
1 tube, T, drill.

1 lifting jack.  
6 picket posts, under.  
Fittings for swords.

On lid of off box (body).  
1 key, powder case.  
1 holdall, needles, and silk twist.

1 camp kettle  
1 lashing, 10 ft. } under.

1 camp kettle  
1 lashing, 10 ft. } under.  
1 cutter, wire (under footboard).

On top of lid of box.  
1 cape, 1 great coat, 1 blanket,  
1 helmet cover, 1 F.S. cap.  
1 mess tin and strap, 1 valise.  
On side.—1 spamer, No. 93, for wheels.

1 grease box, 14 lbs. (under).  
1 portable magazine.  
†1 key, fuze, universal, in pocket.

1 maul (under).

1 grease box, 14 lbs. (under).  
1 portable magazine.  
2 keys, lock, in pocket.  
†1 key, fuze, universal, in pocket.

\* 1 spare sight per battery, with No. 1 Sub-division.  
† When the guns are parked, the fuze keys should be placed in holdalls in limber and wagon body.  
‡1 per battery.

§ Holdall, spare parts, containing { 1 bolt, stop. 3 clips, head axial. 1 cam lever.  
2 keep pins, cam lever. 2 keep pins, carrier ring.  
2 keep pins, bolt, elevating. 6 springs, stud, catch, left.  
6 springs, stud, catch, right. Wire, foresight.  
12 springs, stud, retaining foresight.

On side of box.—1 spade.  
On top of lid of box.  
1 cape, 1 great coat, 1 blanket,  
1 helmet cover, 1 F.S. cap.  
1 mess tin and strap, 1 valise.

On side of box.—1 spade.  
On top of lid of box.  
1 cape, 1 great coat, 1 blanket,  
1 helmet cover, 1 F.S. cap.  
1 mess tin and strap, 1 valise.

B.

## 15-PR. B.L. CARRIAGE AND LIMBER.

(FIELD.)

## L I M B E R .

*On footboard.*

1 pair of drag ropes. 1 swingtree, No. 7.

*Under footboard and limber.*1 water brush.  
1 drag washer.

1 Scott's sight, in box.

1 pickaxe.

Fittings for swords and carbines, in front.

1 felling axe.

1 bill hook.  
1 drag washer, Q.  
2 water buckets.*On top of lid of box.*  
1 cape, 1 great coat, 1 blanket,  
1 helmet cover, 1 F.S. cap.  
1 mess tin and strap, 1 valise.  
*On side of box.—1 spade.*

3 shrapnel shells.	1 case shot.	20 cartridges in cartouche.	20 cartridges in cartouche.	1 case shot.	3 shrapnel shells.
4 shrapnel shells.				4 shrapnel shells.	
4 shrapnel shells.				4 shrapnel shells.	
4 shrapnel shells.		5 fuzes, 1 pad and discs.	5 fuzes.	4 shrapnel shells.	
4 shrapnel shells.		30 tubes, T.	20 tubes, T.	4 shrapnel shells.	
	14 fuzes, No. 56.		16 fuzes, No. 56.		
1 camp kettle.		1 oil can, No. 3, in case.		1 grease box.	
1 portable magazine.				1 portable magazine.	
*1 key, fuze, universal, in pocket.				2 keys, lock, in pocket.	
				*1 key, fuze, universal, in pocket.	

*On lid of near box.*  
†1 tangent sight.  
†1 clamp, tangent sight.  
2 lanyards, T.  
1 vent, T, radial.1 oil can, No. 9, in case.  
1 drift, vent.  
1 rimer, vent, T.1 grease box.  
1 portable magazine.  
2 keys, lock, in pocket.  
\*1 key, fuze, universal, in pocket.*On lid of off box.*3 springs, clip, carrier ring.  
2 washers, vent.  
†1 tangent sight.  
†2 foresights.  
†1 clamp, tangent sight.  
2 trace couples.  
1 screwdriver, 4-inch.  
1 linch pin.  
1 wrench, ratchet, A, 1 do., B.  
1 rimer, vent, T.

## C A R R I A G E .

†1 cleaner and cap.

1 blanket on seat.

Fitted to carry 3 cartridges. 2 shrapnel shells. 1 case shot	1 pincers. 1 spanner, breech, with vent plug attached, on gun.	1 cover, breech, traversing. 1 handspike, traversing.	1 hammer, 1 spanner, 1 tube pocket.
1 cover, bracket, sight, telescopic.			
	1 drag shoe.		

1 tampon in gun.

1 water bucket. 1 water bucket.

1 fuze key, in pocket.

1 spoke brush, in pocket.  
†1 cleaner and cap.

1 blanket on seat.

\* When the guns are parked, the fuze keys should be placed in the holdall in limber.  
 † When not on gun.  
 ‡ Carried with choke end to the rear, when limbered up.

## EQUIPMENT.

## 16-PR. B.L. WAGON AND LIMBER.

(FIELD.)

## LIMBER.

B.

On footboard.

1 pair of drag ropes. 1 swingletree, No. 7.

Under footboard and limber.

1 water brush.  
1 drag washer.  
\*1 Scott's sight box.1 pickaxe. 1 felling axe.  
Fitting for swords and carbines, in front.1 bill hook.  
1 drag washer, Q.  
2 water buckets.On top of lid of box.  
1 cape. 1 great coat. 1 blanket.  
1 helmet cover. 1 F.S. cap.  
1 mess tin and strap. 1 valise.  
On side of box.—1 spade.

3 shrapnel shells.	1 case shot.			1 case shot.	3 shrapnel shells.
4 shrapnel shells.		20 cartridges in cartouche.		4 shrapnel shells.	
4 shrapnel shells.				4 shrapnel shells.	
4 shrapnel shells.				4 shrapnel shells.	
4 shrapnel shells.				4 shrapnel shells.	
	14 fuses, No. 56.	5 fuzes, 1 pad and discs.			
		30 tubes, T.	5 fuzes.		
			20 tubes, T.	16 fuses, No. 56.	
1 camp kettle.	1 oil can, No. 3, in case.			1 grease box.	
1 portable magazine.				1 portable magazine.	
†1 key, fuze, universal, in pocket.				2 keys, lock, in pocket.	
				†1 key, fuze, universal.	

On lid of near box.  
1 tangent sight, spare.  
1 clamp tangent sight, spare.  
2 lanyards, T.  
1 vent, T, radial.Drag shoe:  
1 handspike, traversing, }  
1 sponson, }  
1 handspike, common, and {  
1 sponge, jointed, and {  
1 cap, }  
1 tube pocket, in case.

## BODY.

On lid of off box.  
3 springs, clip, carrier ring.  
2 washers, vent.  
1 foresight (spare).  
2 trace couples.  
1 screwdriver, 4-inch.  
1 linch pin.  
1 wrench, ratchet, A., 1 do., B.  
1 rimer, vent, T.On side of box.—1 spade.  
On top of lid of box.  
1 cape. 1 great coat. 1 blanket.  
1 helmet cover. 1 F.S. cap.  
1 mess tin and strap. 1 valise.

## WAGON

On lid of near box (body).  
1 scissors.  
1 knife, clasp.  
1 tube, T, drill.On lid of off box (body).  
1 key, powder case.  
1 holdall, needles, and silk twist.1 camp kettle } under.  
1 lashing, 10 ft. }1 lifting jack.  
6 picket, posts, under.  
Fittings for swords.1 camp kettle } under.  
1 lashing, 10 ft. }

1 cutter, wire (under footboard).

On top of lid of box.  
1 cape. 1 great coat. 1 blanket.  
1 helmet cover. 1 F.S. cap.  
1 mess tin and strap. 1 valise.

On side.—1 spanner, No. 93, for wheels.

60 T tubes.	16 fuses, No. 56.	16 fuses, No. 56.	Holdall, § spare parts.
32 cartridges in cartouche.			
4 shrapnel shells.	3 shrapnel shells.	4 shrapnel shells.	
4 shrapnel shells.	4 shrapnel shells.	4 shrapnel shells.	
4 shrapnel shells.	4 shrapnel shells.	4 shrapnel shells.	

1 grease box, 14 lbs. (under).  
1 portable magazine.  
†1 key, fuze, universal, in pocket.

1 maul (under).

1 grease box, 14 lbs. (under).  
1 portable magazine.  
2 keys, lock, in pocket.  
†1 key, fuze, universal, in pocket.\* 1 spare sight per battery, with No. 1 Sub-division.  
† When the guns are parked, the fuze keys should be placed in holdalls in limber and wagon body.  
‡ 1 per battery.§ Holdall, spare parts, containing {  
1 bolt, stop. 3 clips, head, axial. 1 cam lever.  
2 keep pins, cam lever. 2 keep pins, carrier ring.  
2 keep pins, pin screw, elevating. 6 springs, stud, catch, left.  
6 springs, stud, catch, right. Wire foresight.  
12 springs, stud, retaining foresight.On side.—1 handspike, in case.  
On top of lid of box.  
1 cape. 1 great coat. 1 blanket.  
1 helmet cover. 1 F.S. cap.  
1 mess tin and strap. 1 valise.

LONDON:  
Printed for Her Majesty's Stationery Office,  
BY HARRISON AND SONS, ST. MARTIN'S LANE,  
*Printers in Ordinary to Her Majesty.*  
(Wt. 1205 250 4 | 97—H & S 6023)

**ORDNANCE, B. L. 15 P.R., MARK I.**

STEEL 7 CWT.

WEIGHT.....	7 ft. 25
PREPONDERANCE.....	0.0 10

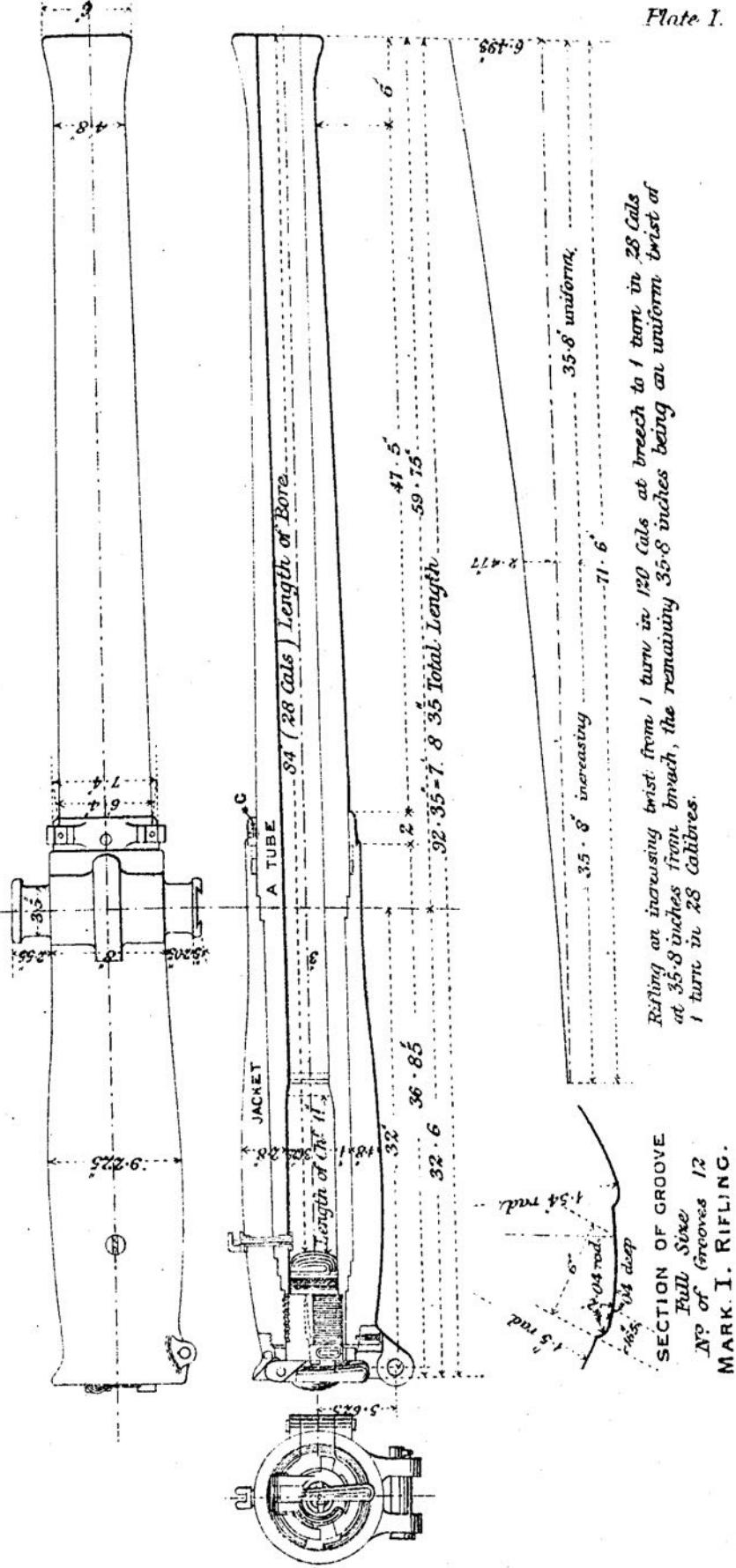
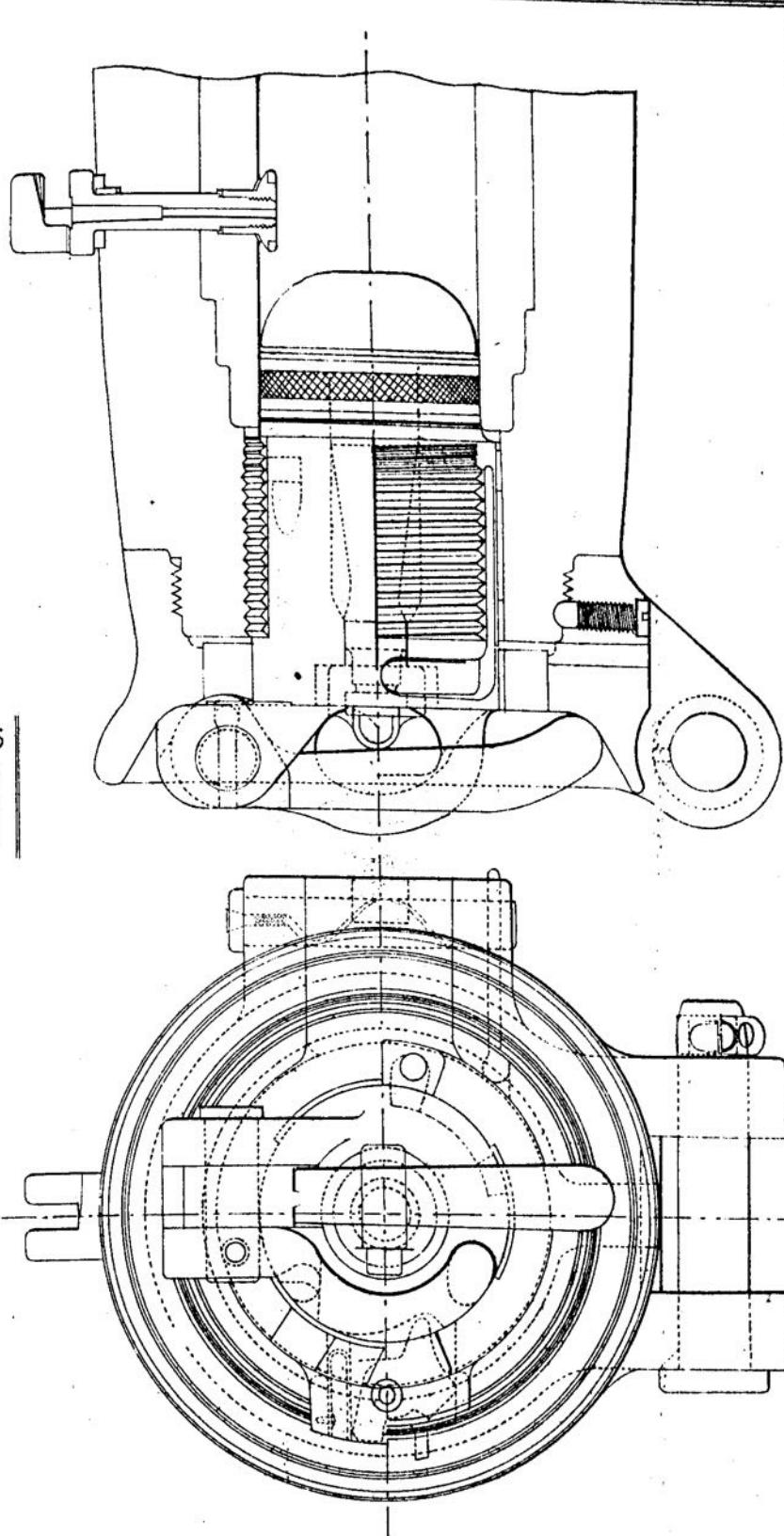


Plate I.

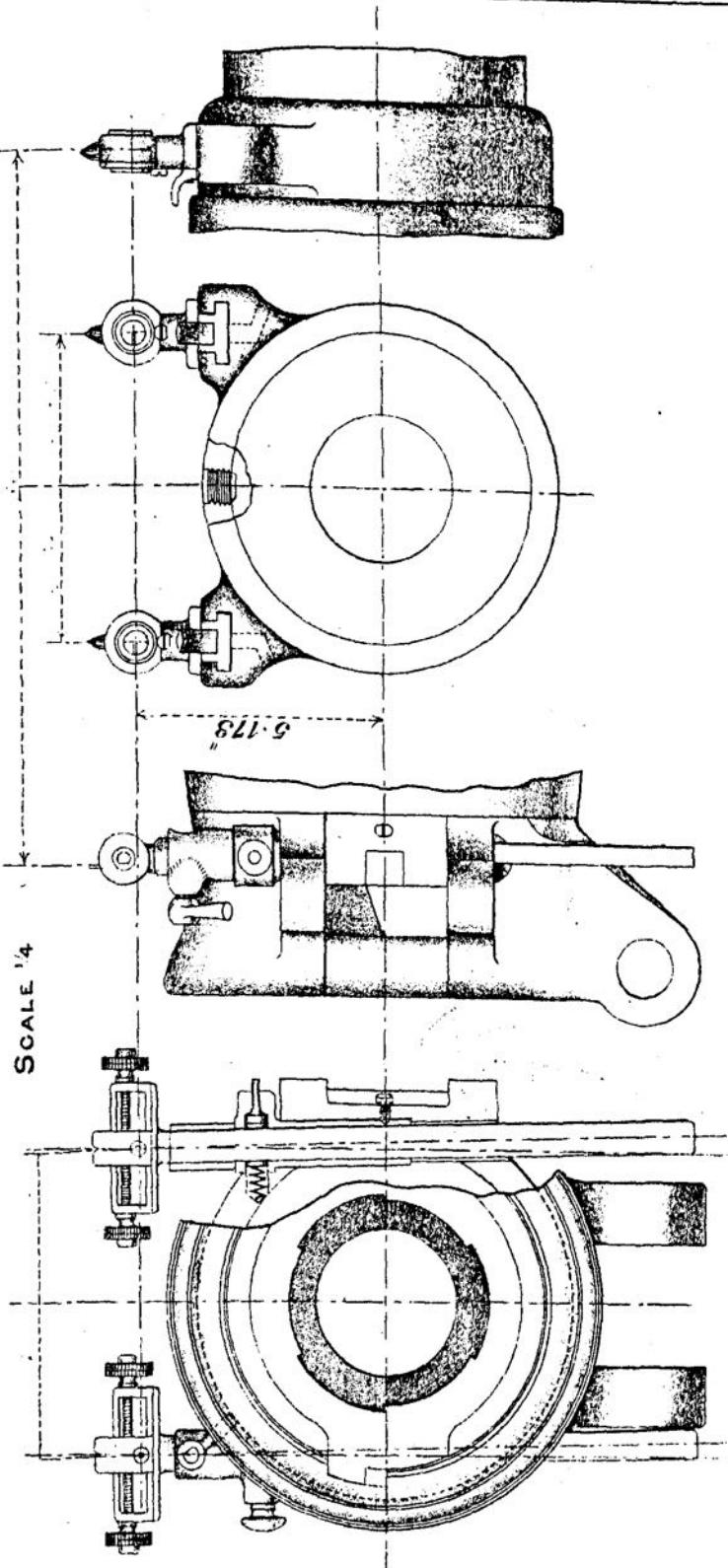
ORDNANCE, B.L., BREECH CLOSING MECHANISM, 15 P<sup>R</sup>, MARK I.

SCALE  $\frac{1}{3}$ .

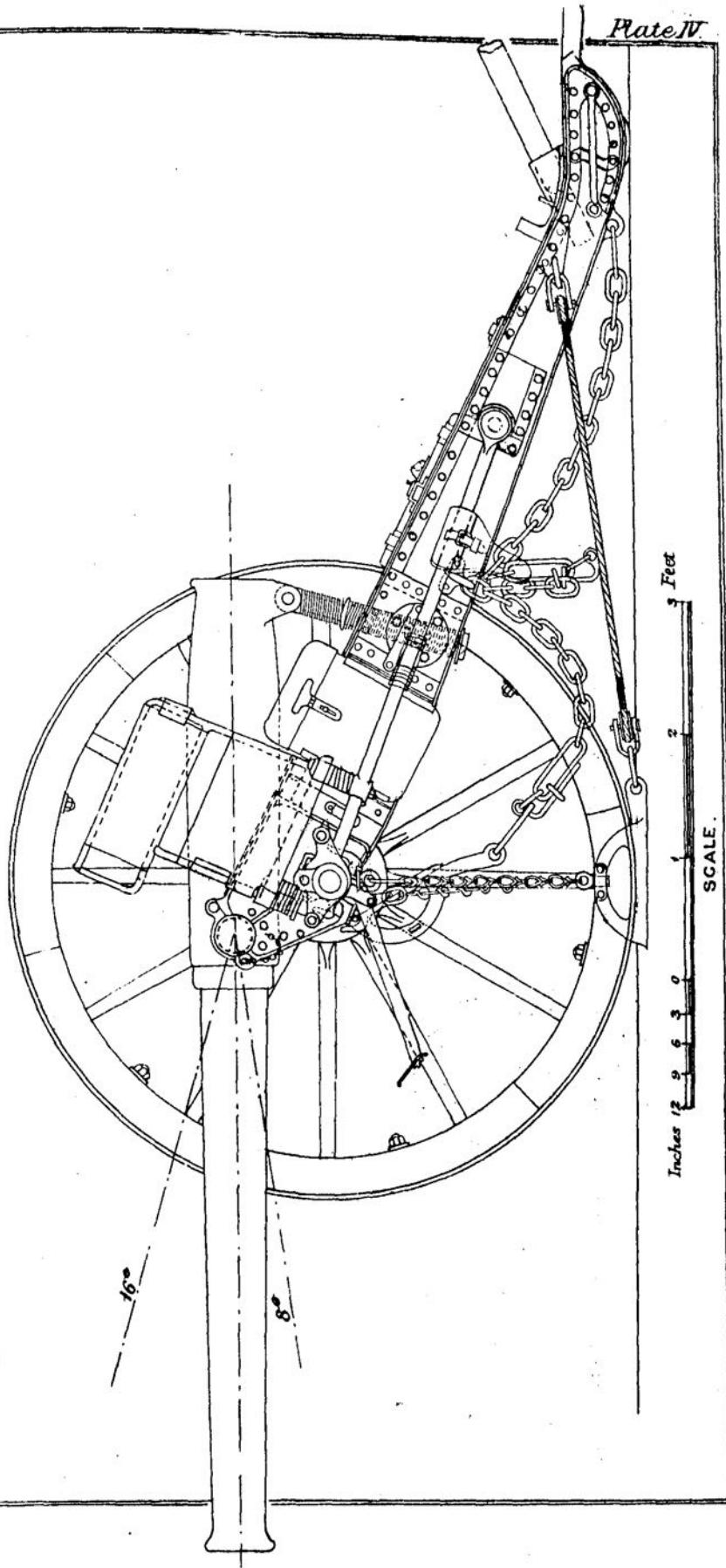


*Plate III.*

ORDNANCE, B.L., SIGHTING, 15-PR.,

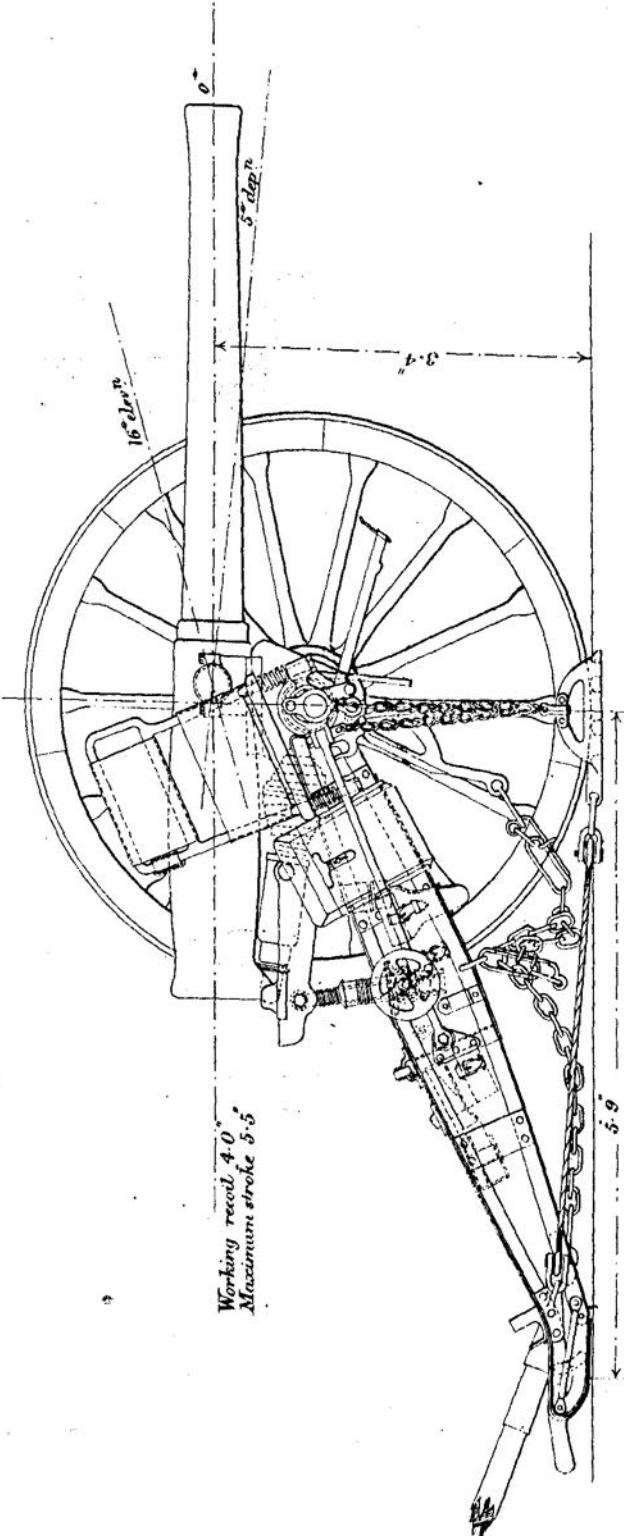


CARRIAGE, FIELD, B. L., 15 P<sup>R</sup>, MARK I.



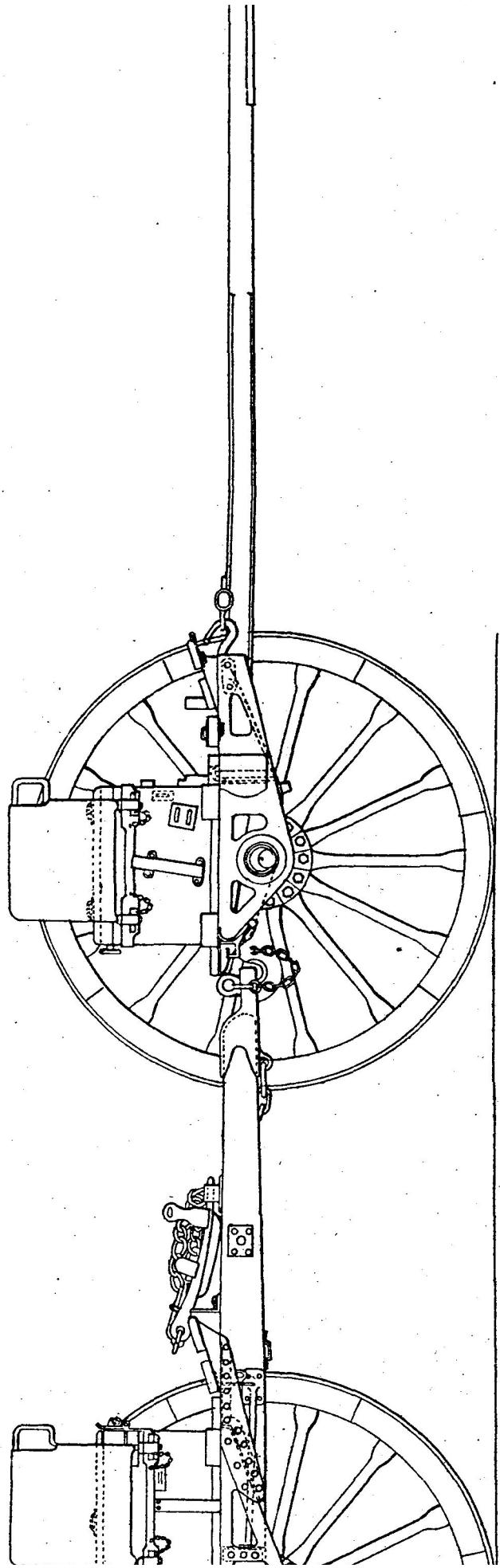
CARRIAGE, FIELD, B. L., 15 P<sup>R</sup>, MARK II.

SCALE  $\frac{1}{20}$  IN.

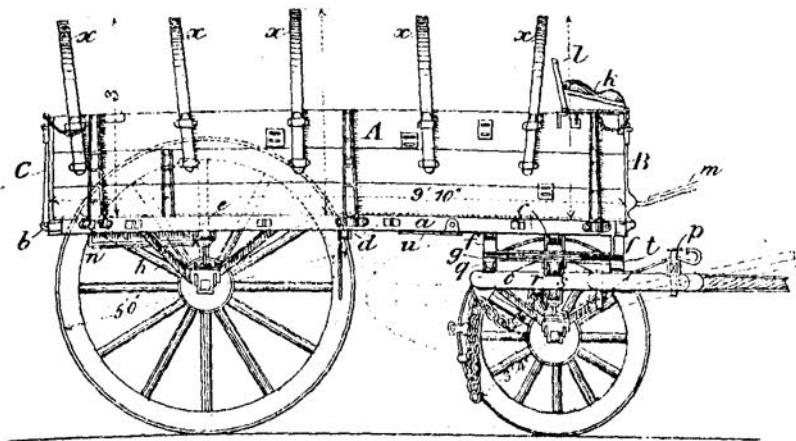


LIMBER, FIELD, B. L., 15 PR, MARK II.  
WAGON, AMMUNITION, B. L., 15 PR, MARK II.

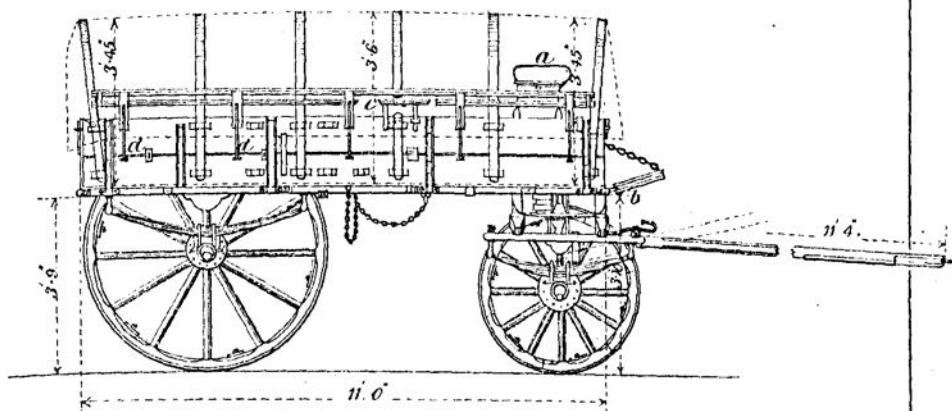
SCALE  $\frac{1}{30}$ .



WAGON, AMMUNITION & STORE, R.A. MARK II.\*



WAGON, ARTILLERY, MARK. I.\*

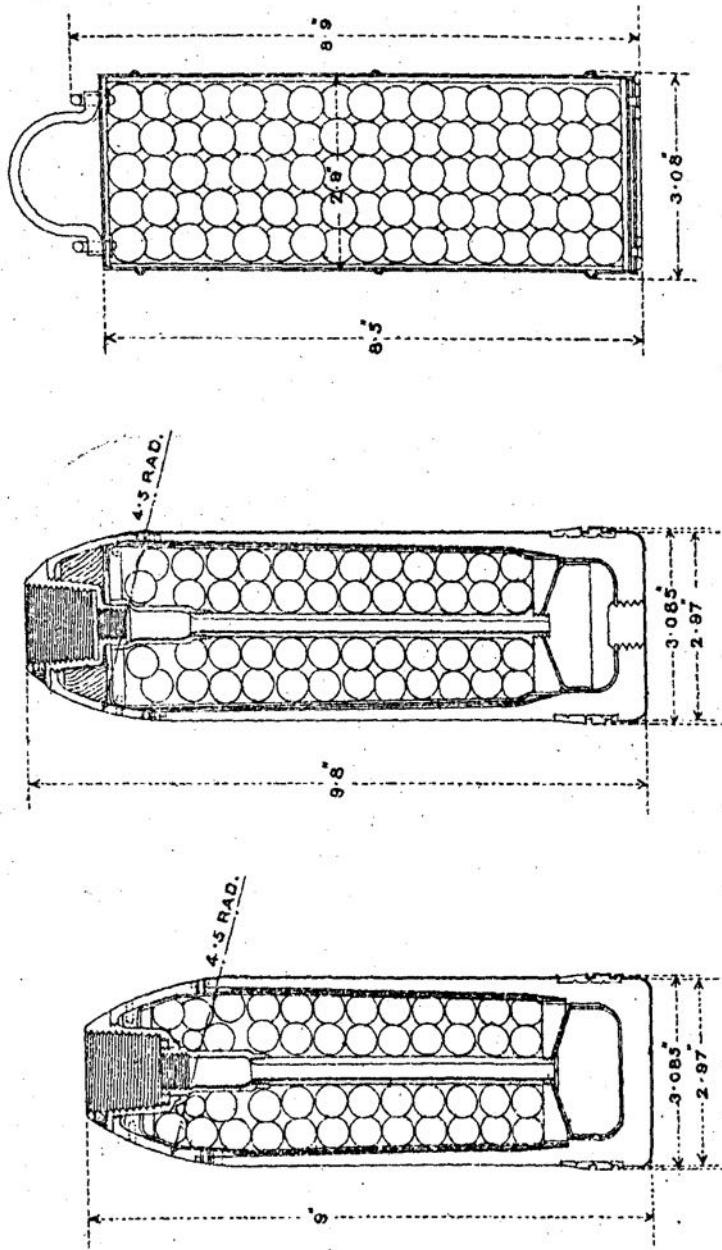


*Plate VIII*

**PROJECTILES, B.L., 15 PR.**

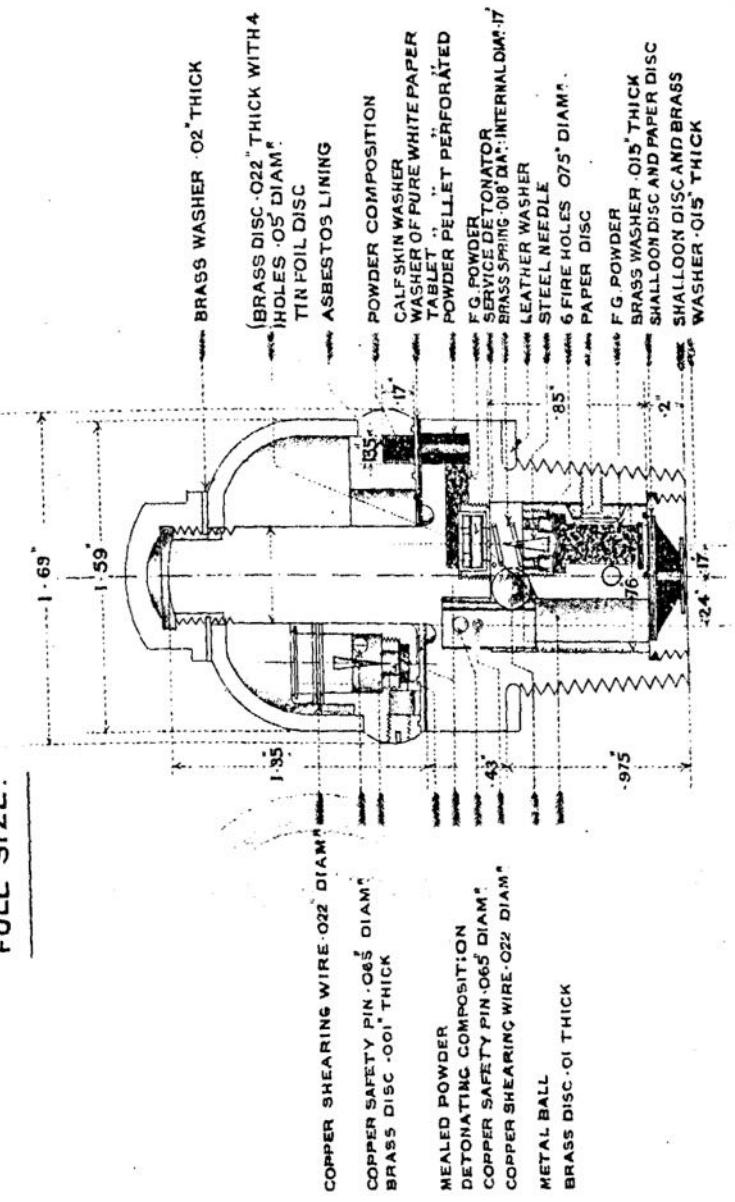
SCALE  $\frac{1}{3}$ .

**SHRAPNEL, MARK II.**      **SHRAPNEL, MARK I.**      **CASE SHOT, MARK III.**



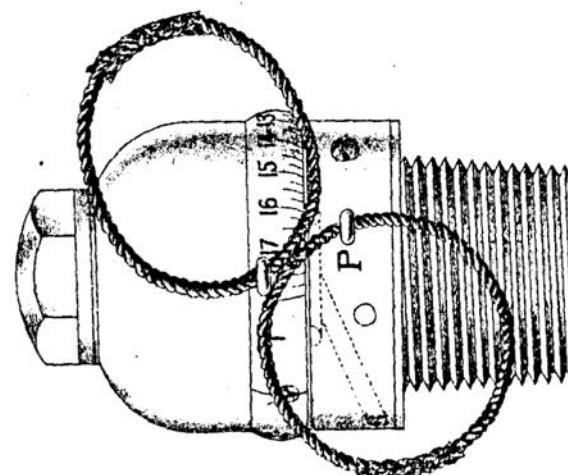
FUZE, TIME AND PERCUSSION, N° 56 (MARK IV.)

FULL SIZE.



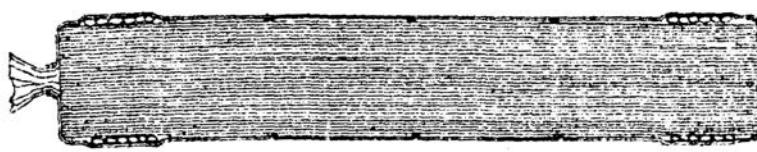
SECTION

ELEVATION

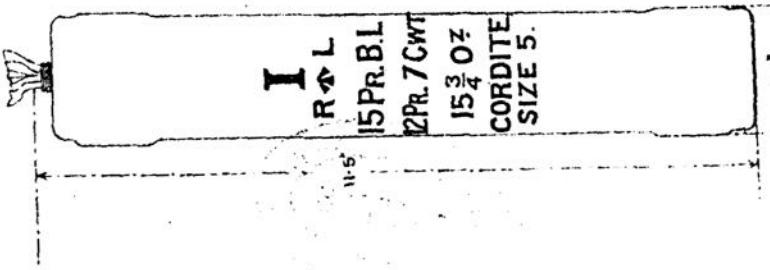


CARTRIDGES, B. L. 15 PR.

15 $\frac{3}{4}$  OZ. CORDITE, SIZE 5, MARK I.



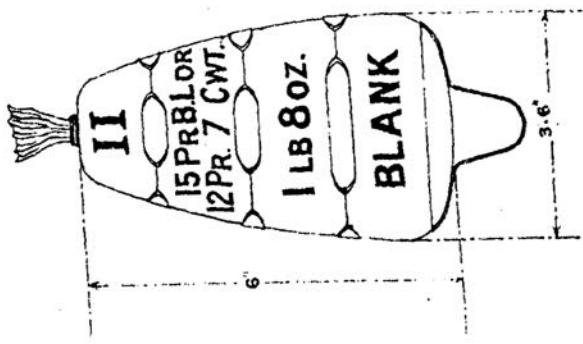
SECTION



ELEVATION

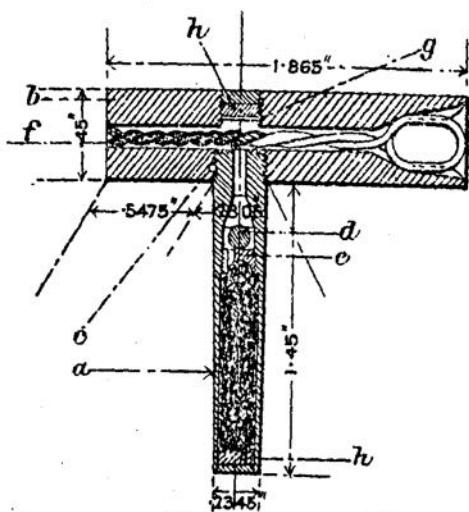
$\frac{1}{2}$  BLANK MARK II. SILK CLOTH.

SALUTING.

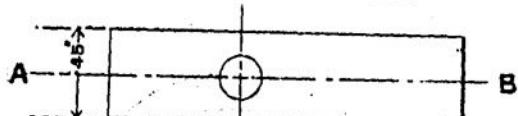


TUBE, FRICTION, T, MARK I.

*Full size.*



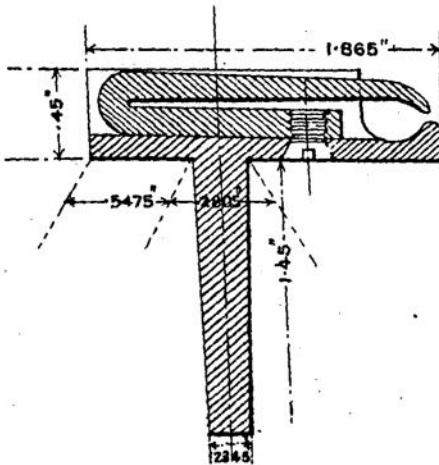
SECTION AT A.B.



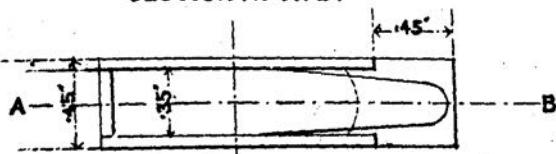
PLAN.

TUBE, FRICTION, T, DRILL, MARK I.

*Full Size.*

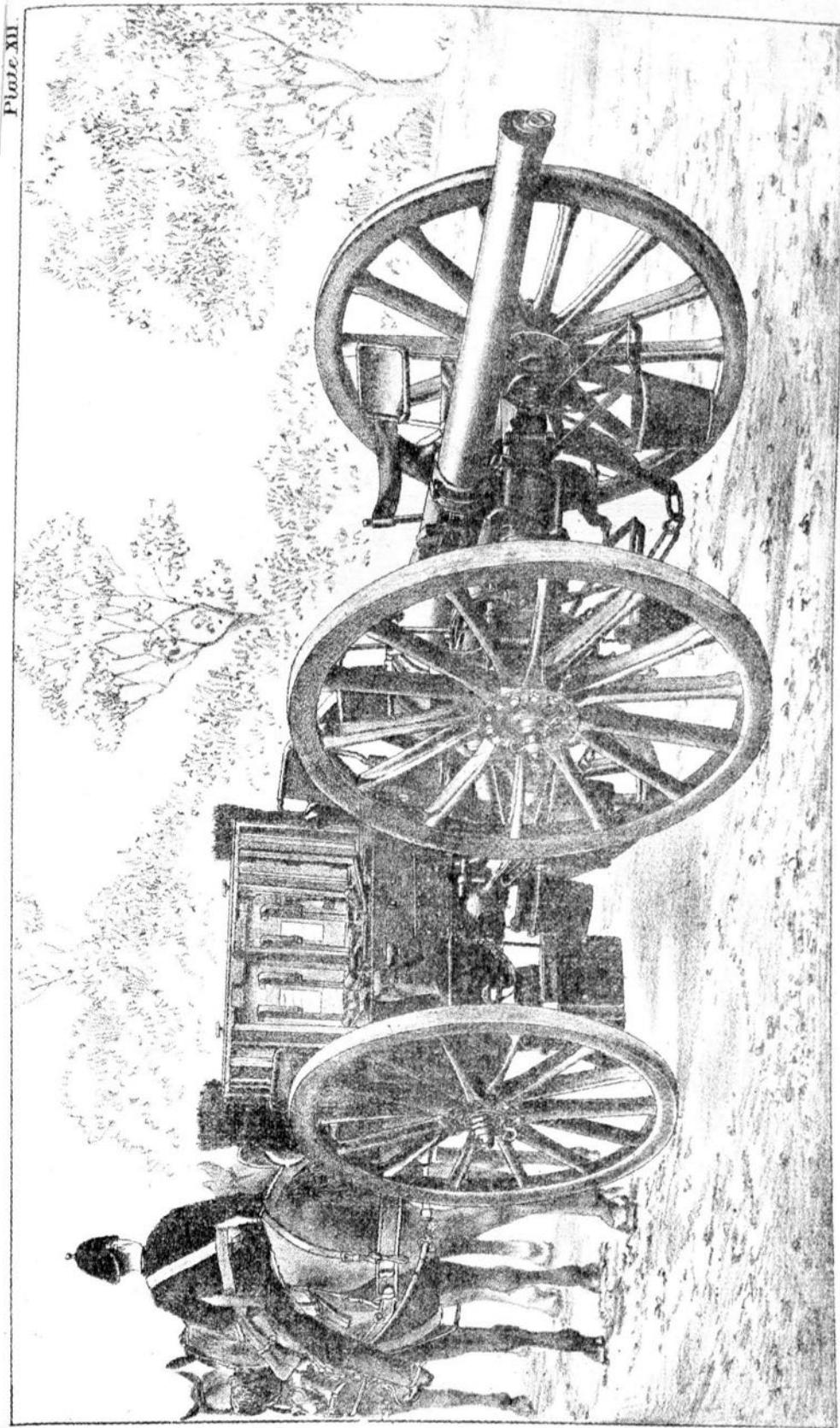


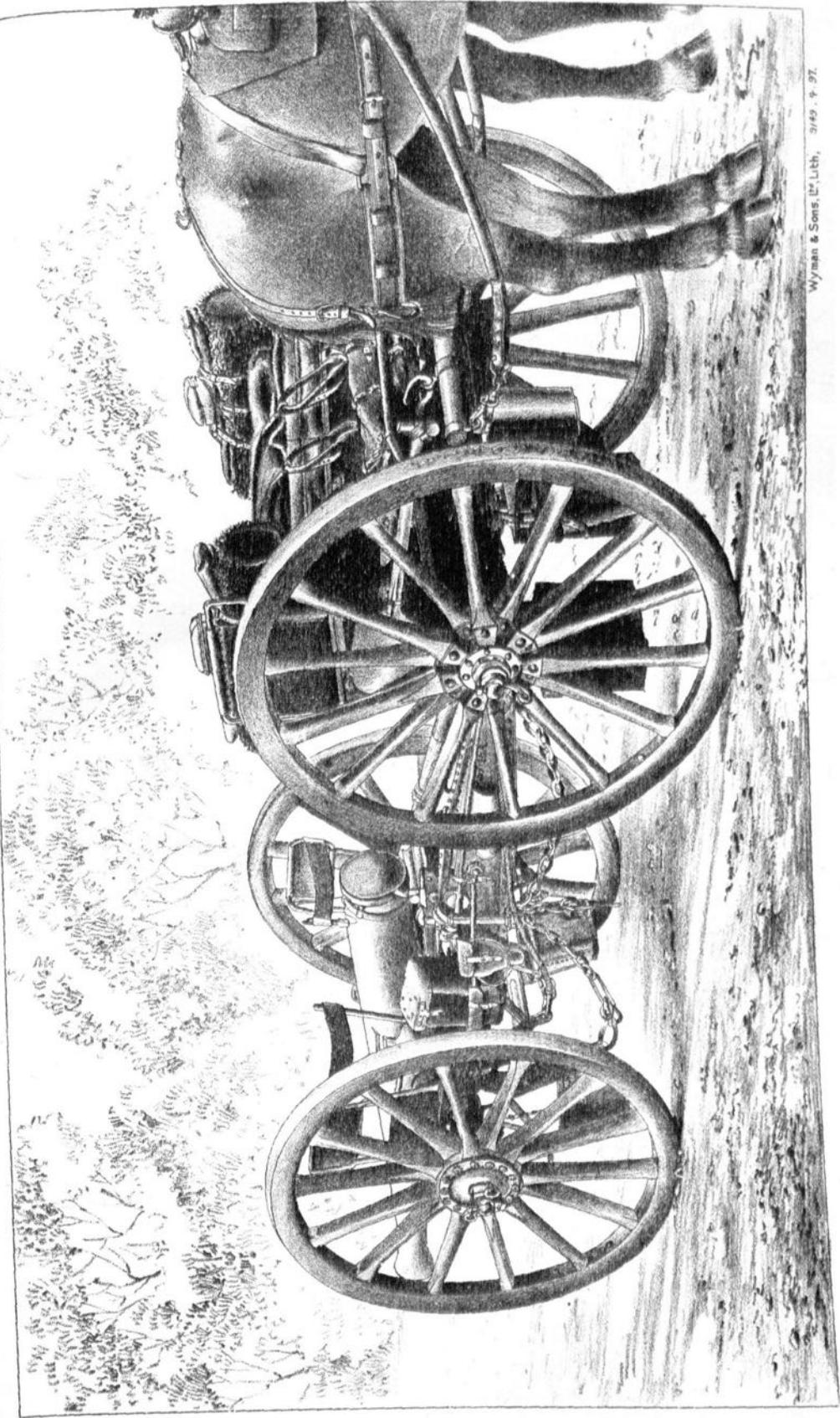
SECTION AT A.B.

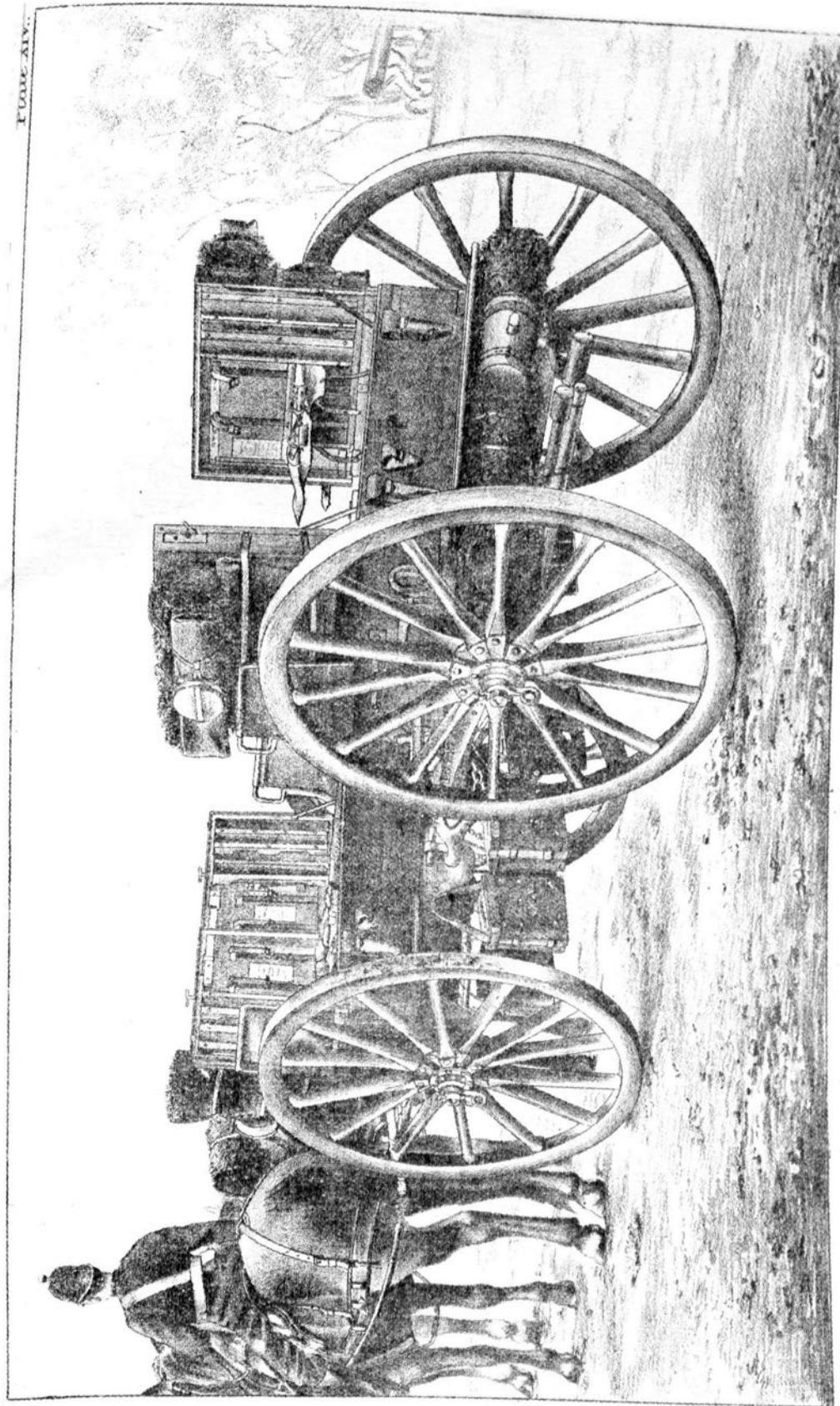


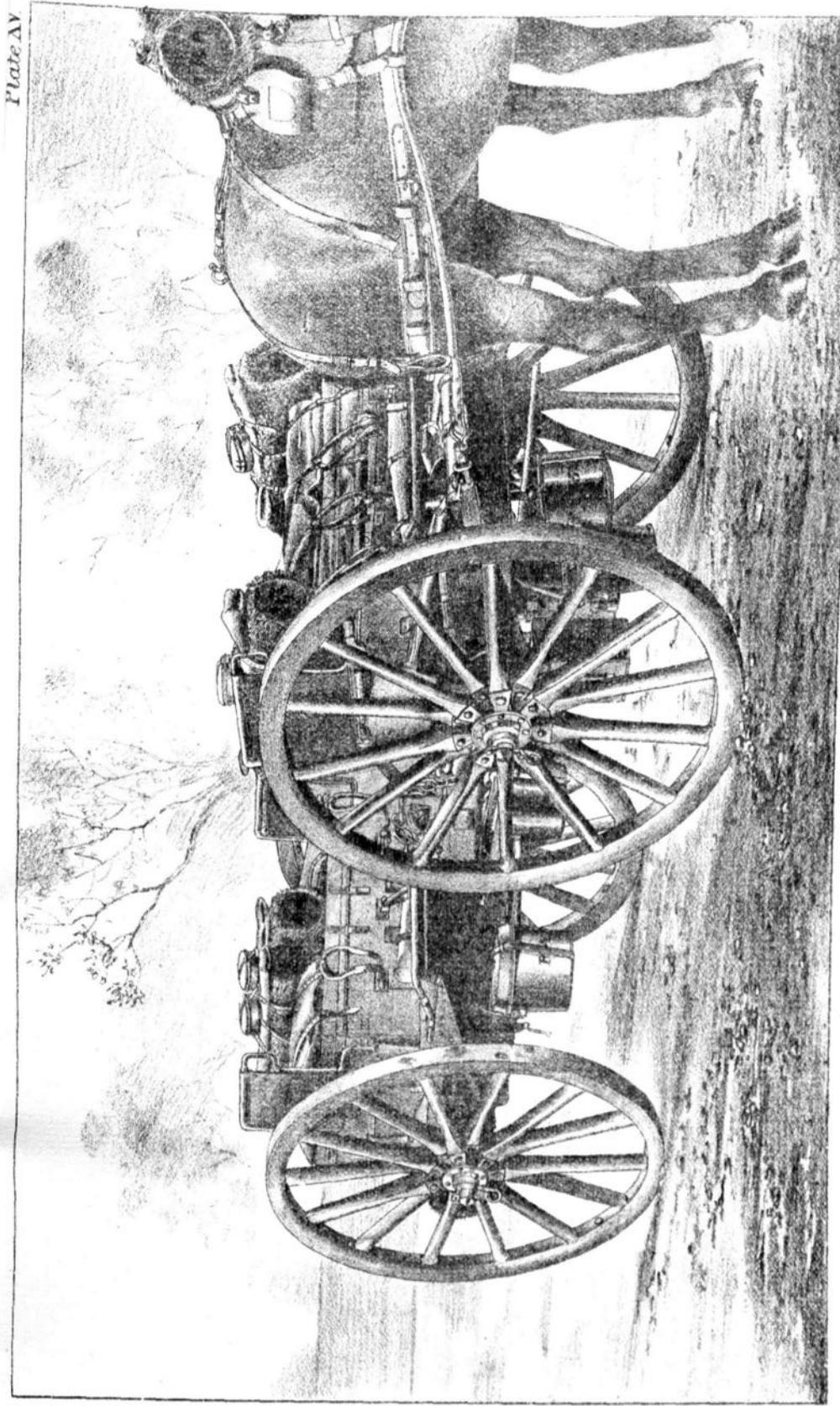
PLAN.

PLATE XIII.

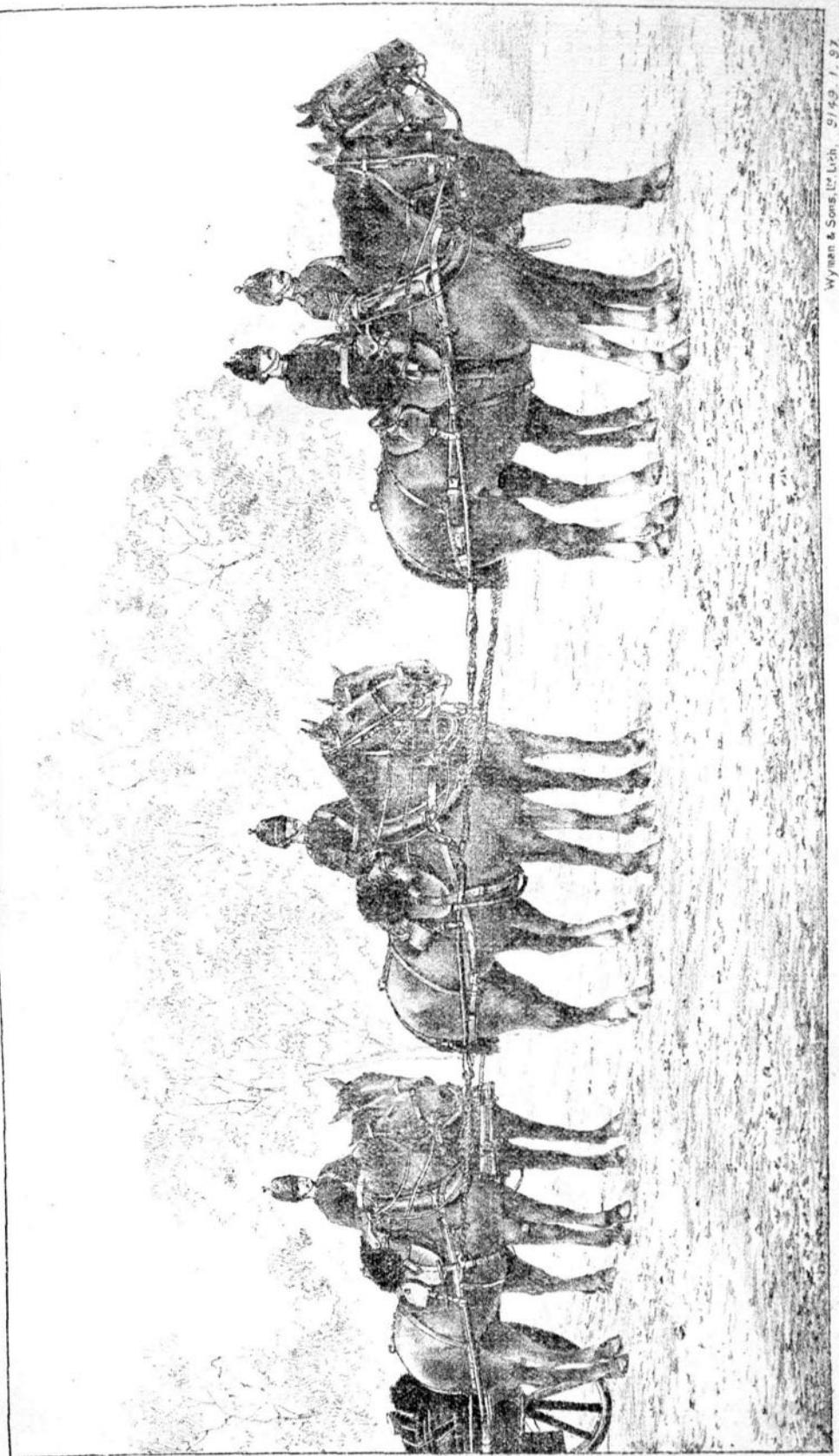








*Plate XVI.*



Wyman & Sons, Ltd. Lith. 9/49. F. 97

